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THE OTTAWA NATURALIST

Vol. XXXII. APRIL, 1918. No. 1.

FOREWORD.

With the appearance of this number of THE OTTAWA NATURALIST a new era in the history of The Ottawa Field-Naturalists' Club is launched.

THE OTTAWA NATURALIST was established in 1887 as the organ of the Ottawa Field-Naturalists' Club. It is now in its thirty-second year and is one of the oldest natural history periodicals in North America. While modest in form and not too prepossessing in appearance, it has published many important papers and the great number of original descriptions that have appeared in its pages makes its files a necessity in libraries of original research in biology.

The time has come, however, when a local periodical of this nature is inadequate and the Dominion requires a more creditable and representative publication for the record and dissemination of the results of scientific research. THE OTTAWA NATURALIST, with its already established position, long and honorable history and scientific standing, seems a logical nucleus from which such a publication should be developed.

Beginning, therefore, with this number, THE OTTAWA NATURALIST will appear in an improved form. The size is enlarged and the number of pages increased. The better paper used throughout will permit of more and finer illustrations; these will improve the appearance and add interest and value to the magazine. To widen its geographical sphere of influence a change of name to one of less local significance is being considered but cannot, by the constitution of the Club, be effected until next year.

In order to reach the highest possible degree of usefulness, the interests of the general, the educational and the technical public will be considered. Teachers in the various schools of Canada, will, it is hoped, find in the pages of THE NATURALIST information which will be of value to them in connection with their teaching of elementary natural science and nature study. It will, therefore, be the editorial policy to publish papers that will appeal to each of these classes of readers.

The further improvement of the publication will rest entirely with the public and the amount of support received will decide whether it succeeds or fails. This fundamental change will naturally involve additional expense, but we have enough faith in the necessity and promising nature of the enterprise to count upon the support of the nature lovers and workers of the Dominion.

We have long felt that there was a field in Canada for such a magazine for the permanent recording of noteworthy biological data and as an assistance and source of pleasure to nature lovers in general.

The proposed increase in size, improvement in appearance and widened geographical appeal involves a heavy financial burden that can be covered only by an enlarged and nation-wide subscription list.

Members of the Club and present subscribers are urgently invited to assist in building up the subscription list. Names of new subscribers with remittances should be sent to the Treasurer of the Club, Mr. J. R. Dymond, Seed Branch, Department of Agriculture, Ottawa.

The subscription price is the same as heretofore, namely $1.00 per year. If personal cheques are remitted, ten cents should be added to cover bank exchange. Nine numbers will constitute a volume, no issues appearing for the months of June, July and August.

Natural history societies throughout Canada are also invited to join with us in making this publication not only indispensable to every working naturalist but one which will be found acceptable to a very large class of people who are always eager to read of the things of nature.

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WILD PLANTS AS FOOD.

By F. W. WAUGH.

A subject regarding which rather little is known, and which would well repay investigation, is the edibility of the various weeds,plants and other vegetable materials which grow in a wild or uncultivated condition in fields, woods, and waste places generally. The writer's attention was directed to this originally by a study of the food plants used by Indian tribes, though a portion of the information has been obtained from other sources.

The more extended use of our natural food resources could be made to supplement garden production in such a way as to leave a greater acreage for staple products, a special advantage under present conditions.

A knowledge of our native vegetable foods will no doubt also be of interest to campers and those taking extended trips through unsettled parts of the country.

MUSHROOMS.

The mushrooms have attracted more attention, possibly, than other vegetable foods, and an increasing number of people are becoming interested in them scientifically, as well as in their collection for use.

The wide distribution of our edible fungi gives them an important place in the list of cheap and easily-obtained foods. Most of them are easy to identify and the search for new or additional species provides a constant source of interest.

A spore-print should always be taken if any doubt exists as to the identity of a gill-bearing fungus. A piece of white paper is brushed over with a not very strong solution of gum arabic and allowed to dry. The stem of the mushroom is sliced off carefully close to the cap, and the latter is laid on the paper, gills downward, then covered with a bell-jar or drinking-glass and left for a few hours. The spores adhere to the paper in radiating lines and afford a means of deciding their color, which is of importance in identifying them.

Last year the writer collected and made use of over a dozen species of mushrooms, the majority collected within city limits. These were frequently obtained on the way to work; though now and then a bicycle jaunt in the early morning or at the week-end assisted in rounding out the supply.

Damp weather or frequent showers are a practical necessity for mushroom growth. Consequently, if the season is unusually dry, very few of the fungi will be found. In favorable seasons, however, they last right along into frosty weather.

A shady corner in a backyard provided a liberal supply of puffballs *(Lycoperdon pyriforme)* for two or three weeks.

A very common city mushroom is the *Coprinus comatus*, or shaggy mane. This, as well as the closely related species, the Common Inkcap, *Coprinus atramentarius*, was found growing around parks, lawns, roadsides, factory sites, and dumping-grounds for street sweepings. Morels also grow among park shrubbery, as well as in the woods among the ferns and evergreens. The Smooth Lepiota, *Lepiota naucina*, is another which is found quite frequently in shady places. This is of about the same height and general appearance as the common mushroom, although the gills are white in young specimens, becoming slightly pink when older. Care should be taken to differentiate this from the poisonous Amanitas.

Another, but not very common species, at least locally, was the Early Pholiota, *Pholiota praecox*. Enough for half a dozen meals of these was found from time to time under some snowball and lilac shrubs in a neglected dooryard.

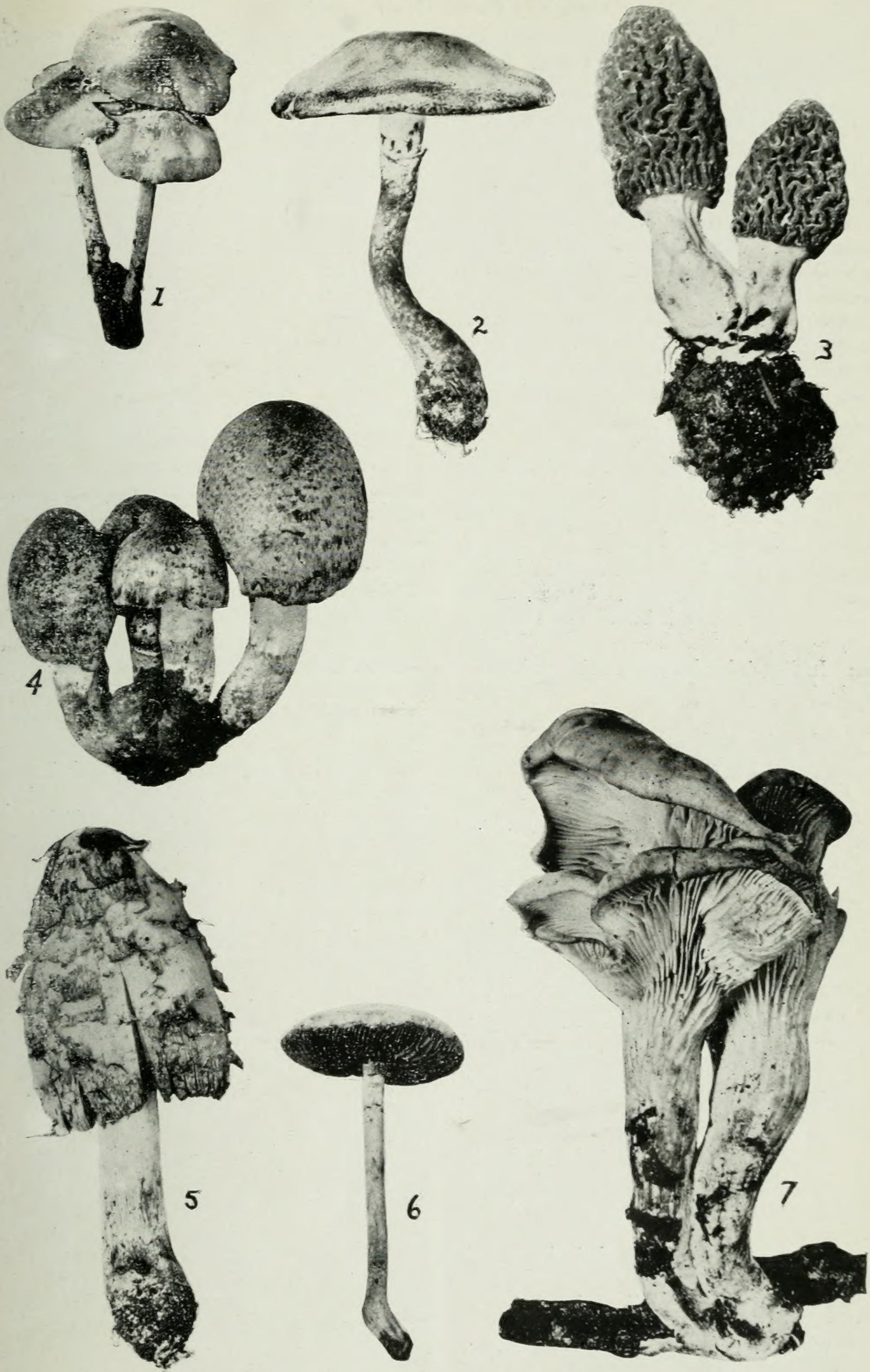
Other species found in suburban localities were: Oyster Fungus, *Pleurotus ostreatus;* Fairy-ring Mushroom, *Marasmius oreades*, and Glistening Inkcap, *Coprinus micaceus*. The *Agaricus campestris*, or common mushroom, was also found occasionally, but not so plentifully as some of the others mentioned.

A friend, to whom the writer had mentioned the edibility of the giant puffball, *Lycoperdon giganteum*, one day brought in one of these about seven inches in diameter. The fungus was white and in prime condition for eating and was quite large enough for seven or eight persons. A reliable method of cooking is to slice and fry in butter. Unfortunately, this fungus is rather uncommon.

The fungi mentioned are merely a few of those likely to be found locally, but will afford the beginner an idea of the possibilities.

GREENS.

Another, and even more prolific class than the mushrooms, consists of those vegetables which are prepared like asparagus or spinach. The Indian tribes of America were evidently well-versed in these and are capable of affording us valuable suggestions. A very good list for the Iroquois, an eastern woodland tribe, appeared recently in Memoir 86 of the Geological Survey of Canada. This includes some sixteen or more vegetables used



COMMON EDIBLE FUNGI.

1—*Marasmius oreades;* 2—*Lepiota naucina;* 3—*Morchella conica;* 4—*Coprinus atramentarius;* 5—*Coprinus comatus;* 6—*Pholiota praecox;* 7—*Pleurotus ostreatus.*

From photographs loaned by Mr. J. M. Macoun, Botanist of the Geological Survey, Ottawa.

as greens, though even this does not exhaust the list.

European immigrants from central Europe make extensive use of the young tender dandelion leaves which appear in the beginning of the season. These may be used as a salad, like chicory, with the addition of salad oil and seasoning.

Another method is to parboil, like spinach or similar greens, add a litle salt when nearly cooked, drain, then season with butter, salt and pepper. A hard-boiled egg or two, sliced, may be used to garnish.

A favorite method in use among old country people (before the war?) is to heat some bacon gravy or fat to the boiling-point and pour it over the raw or uncooked leaves. Some fresh green onions, nicely chopped, are added to this, also some vinegar, and some seasoning if necessary.

Another well-known use of dandelion is the employment of the flowers for making home-made wine; a beer is also made from the young plants by adding a little syrup and yeast.

The edibility of bracken shoots, or "fiddleheads", is apparently quite well-known in Europe, though few seem acquainted with it here. There are few weeds or wild plants which are more plentiful than bracken. In fact, it has become a nuisance in many places in hayfields and pastures. The "fiddleheads" are steamed or parboiled, then served on toast, or otherwise, with a butter or cream sauce. These are easily the most delicious of any of the greens given. The scientific name of the plant is *Pteris aquilina.*

The young shoots of the sensitive fern (*Onoclea sensibilis*) may be used in a similar way to bracken.

Somewhat better known as a food, probably, than the ferns is the marsh marigold, *Caltha palustris.* This is a cosmopolitan plant with a very extensive range in North America. It also is gathered when young and tender, and cooked like spinach. If eaten after the flowers have appeared it is said to be rather bitter. It is better parboiled in any case.

A fine material for greens are the young shoots of the common milkweed, *Asclepias syriaca.* This is found very widely as a weed along roadsides and in waste places generally. The plant is gathered just as the first spike, four to six inches in height, appears above the ground. It is parboiled, that is, the water is poured off after boiling once, and a second boiling is given. The greens are then seasoned, some butter being added if desired. This is a favorite vegetable among the Iroquois, who later on use the upper leaves, as well as the clusters of flower-buds when they first come out.

The waterleaf, *Hydrophyllum virginianum,* is another plant of which the young leaves may be used as greens. The following also have the same value: yellow dock, *Rumex crispus*; nettle, *Urtica dioica;* wood betony or lousewort, *Pedicularis canadensis* and *P. lanceolata;* skunk cabbage, *Symplocarpus foetidus*; wild leek, *Allium tricoccum* and garlic, *A. canadensis.* All of these should be gathered when quite young. Gloves are required in gathering nettles.

Among the introduced weeds or plants used in the same way are: lamb's quarters, *Chenopodium album*; red-root pigweed, *Amaranthus retroflexus;* black mustard, *Brassica nigra;* and purslane, *Portulaca oleraca.*

Mustard is said to form an excellent salad green. Sandwiches of bacon, cheese, and other materials are certainly improved by a few young, crisp mustard leaves dipped in a salad dressing.

Other familiar wild plants used as salads are: watercress, sheep sorrel, *Rumex acetosella,* and oxalis. The Ojibwa of the Lake Nipigon region eat the bases of the great bullrush, *Scirpus validus.* These are eaten as a sort of refreshment just as they are.

The most recommendable of the greens and salads referred to would certainly include: bracken, leeks, garlic, pigweed, lamb's quarters, milkweed, dandelion, marsh marigold, purslane, sheep sorrel, mustard and cress. Possibly one or two others should be included, to make allowance for differences in taste.

Sorrel, *Rumex acetosella,* prepared in various ways, is a noted European vegetable. It is made into a sort of soup-like beverage, to which is sometimes added sliced cucumbers, or hard-boiled eggs sliced.

The following is a recipe for "cream of sorrel soup": Cook a cupful of chopped sorrel in a tablespoonful of butter, add a little sugar, half a tablespoonful of vinegar, a tablespoonful of salt and two of rice, then a pint of boiling water. Let simmer until the rice is soft. Add three cupfuls of veal or chicken stock and strain. Beat an egg yolk slightly, add a cupful of light cream and turn into the soup; stir until it becomes hot, then strain and sieve.

Mrs. E. Sapir, of Boston, Mass., has kindly given me the following Lithuanian recipes for the preparation of sorrel: Wash the plant; chop well and add boiling water sufficient to make a soup. Let cook for about ten minutes. After cooling "whiten" with eggs and milk or eggs and cream—these being beaten together and seasoned to taste with salt. The soup is eaten cold or warm.

A second way of preparing is to cook with meat. First, cook the meat until tender, then add the sorrel, previously washed and chopped up well. Let cook for ten minutes; then "whiten" with eggs only (beaten), and eat while hot.

The sorrel, according to our informant, was also frequently "canned", by simply chopping up and filling into bottles for use in the winter.

There are several wild mints which may be made into mint-sauce and used quite acceptably as relishes with meat.

ROOT FOODS.

The bulbs of the leek, *Allium tricoccum*, and the garlic, *Allium canadense*, are found very plentifully in many localities and are quite as good eating as onions and other garden vegetables of the kind.

Other edible roots found in similar situations are pepper-root, *Dentaria diphylla*, and Indian cucumber-root, *Medeola virginiana*. Pepper-root has a pungent, cress-like flavor and is frequently eaten as a salad with a little salt and pepper. Indian cucumber-root may be eaten in the same way and is very much like the cucumber in flavor.

In Western Canada there are a number of food roots which are used more or less extensively by the Indians. Several of these, such as the dog's-tooth violet, *Erythronium grandiflorum*, and the Claytonia, have eastern representatives which may also offer some possibilities. Both have tubers which can be found only by digging down about seven or eight inches into the soil.

The most widely known of the western food materials is probably the root of the camass, *Camassia esculenta*. This plant belongs to the lily family. The roots are dried and afterwards cooked in pits by means of hot stones placed at the bottom, a large fire being also kindled on the top. In filling the pit, the roots are placed alternately with the branches of the fir and other trees. Other roots are prepared in the same way, some requiring a couple of days' cooking.

Various southern British Columbia tribes use the roots of a western form of the bracken, *Pteris aquilina* var. *lanuginosa*. The root of a lily, *Lilium columbianum*, is also cooked and eaten.

BARK AND STEM FOODS.

Many of our Indian tribes still use the bark and other portions of the stems of trees, shrubs and plants.

The Ojibwa Indians peel off the outer bark of the birch and poplar and scrape up the juice mixed with the woody material found beneath. This is quite sweet and is in high favor as a means of refreshment.

The Iroquois use the fresh shoots of the grapevine, *Vitis vulpina*, raw, without peeling; also those of the white pine, *Pinus strobus;* sumac shoots are peeled and eaten, as are those of the red raspberry, *Rubus idaeus aculeatissimus*.

The Indians of southern British Columbia use in the same way the young shoots of the cow parsnip, *Heracleum lanatum*, these being considered a great delicacy; also those of the great willow weed, *Epilobium angustifolium*, the various kinds of raspberry, and the *Balsamorrhiza sagitta*, the latter being peeled.

The Iroquois claim to have pulverized the bark of the soft maples, *Acer saccharinum* and *Acer rubrum*, and made it into a bread. This was no doubt an emergency or famine food.

Slippery elm, *Ulmus fulva*, inner bark is frequently boiled by various Indian tribes and the mucilaginous decoction eaten as a food.

The stems and leaves of plants and the bark and twigs of shrubs and trees were quite commonly, and are, even at present, steeped and drunk as beverages at meal-time. Among these were the twigs of the black birch, *Betula lenta*; the spice bush, *Benzoin aestivale*; the witch hazel and the red raspberry; the roots of the sassafras and the stems of the wintergreen, yarrow, *Monarda fistulosa* and others. Even hemlock leaves were sometimes employed in a similar way. For a more extended reference to Iroquois beverages, see Memoir 86 of the Geological Survey, Department of Mines, Canada, p. 144.

FRUITS.

There are several wild fruits which apparently have received but little attention recently, though they were no doubt more popular a century or so ago.

The elderberry is often allowed to go to waste, although it is excellent for pies and makes a fairly good, but somewhat seedy, preserve. It was formerly in demand for making wine.

The wild black cherry, *Prunus serotina*, is very plentiful in many places. This can be made into a most appetizing jam for pies and other purposes. It is also supposed to have medicinal virtues. Black cherry wine is a well-known beverage.

The chokecherry, *Prunus virginiana*, grows throughout a range somewhat similar to that of the black cherry, and is also used for jam.

The wild gooseberry is often found in considerable quantities and makes an excellent preserve and sauce. The prickles are removed by scrubbing the fruit about in a stout bag.

Various species of Juneberry, (*Amelanchier* spp.) are preserved, or eaten raw with cream and sugar.

A very good substitute for cranberries is found in the high-bush cranberry, *Viburnum opulus*. This also has quite a wide distribution.

The ground cherry (*Physalis* spp.) is found growing in many places, and makes a very good sauce or preserve. It is gathered when ripe, a condition indicated by its becoming greenish-yellow, also by the yellowing of the husk.

SEEDS.

A material to which greater attention might in some instances be given, is the wild rice, *Zizania aquatica*. This makes an excellent ingredient in soups, especially meat soups. At present it is obtained mostly from the Indians. It has frequently been sown in marshes to attract wild fowl, also as an article of food.

THE SONG OF THE PORCUPINE.

By P. A. Taverner.

Mr. Macnamara's interesting paper on the Porcupine in the January, 1918, number of The Naturalist, reminds me of an experience I once had with this species that may be of interest to the readers of the article referred to.

I was paddling close along the shore of Lake Muskoka late one bright moonlight night in early spring, probably May. As I crossed the mouth of a small deep dark bay, I heard a most peculiar succession of cries coming from the shadows at its foot. It was like the continued ya-ya-ya-yaa-a-a-a of a young baby and rose and fell with prolonged querulous quaverings. Wondering at what could originate such sounds in the woods I knew so well, I followed up the sounds, landed and forced my way into the underbrush in their direction. They seemed to proceed from near the top of a large ash tree near the shore. While manœuvring about trying to get the newly leafing branches outlined against the best illuminated parts of the sky, the idea suddenly suggested itself that such cries might well proceed from a cub bear. The thought was disquieting for if the mother found an intruder about she might misunderstand the purely scientific designs of the investigation. I retreated immediately and with haste, and soon had a safe body of water between myself and possible danger. The sounds continued for some time, longer in fact than I cared to stay, and I left without discovering their origin.

A few days later, however, in broad daylight, the same cries were heard just back of the house and immediate investigation showed that they proceeded from a big fat "porkey" in a small maple tree, who was telling the whole world how mournfully happy it was in the warm spring sun. I presume it was of the nature of a love song and for the attraction or delectation of a mate, at least another porcupine, presumably a mate, was found in the vicinity shortly after.

I have never heard this spring song of the Porcupine since, nor have I ever met a northern woodsman who seemed acquainted with it. A superficial search of mammalogical literature has failed to reveal detailed references to it and I think, therefore, it may be worthy of record in these pages.

MAMMAL FOOD OF THE GREAT-HORNED OWL.

Late in the afternoon of December 31st, while following skunk tracks in a small strip of hardwood bush, four miles north of St. Thomas, Ontario, I observed a Horned Owl in a maple overlooking what appeared from external signs to be the winter den of a skunk family. The bird was secured and on picking it up I found the odor of skunk very pronounced.

On opening the carcass three days later for sex determination, was surprised to find the ligaments and fat surrounding the stomach full of porcupine quills. They were quite pliable, slightly bleached and appeared to have been in the bird's body for some time. Two pellets of skunk hair about the size of robin's eggs were the only contents in the stomach. The owl appeared in spite of the quills to be in a healthy condition.

C. E. Johnson.

A CROW POLYGAMIST?

In the latter part of May while passing through the Rideau woods near Ottawa, I saw an exceptionally large nest situated about forty feet up in a white pine tree, and a crow circling and cawing above it. As I climbed the tree two more crows flew from the nest which contained eight eggs, without doubt two sets, as four of them had the light ground colour blotched chiefly on the larger end, while the other four had a darker ground colour, and were profusely blotched.

Clyde L. Patch.

UNUSUAL FOOD OF THE GARTER SNAKE.

While two friends and I were standing by Kingsmere Lake on May 5th last, a green garter snake left the shore, swam a few yards into the lake, ducked its head under the water and swam back to shore with a trout about three inches long in its mouth. The fish was held by the middle but on reaching the shore it was dropped on a small piece of wood and immediately taken up again by the head and swallowed. Not more than three or four minutes had elapsed between the time the snake left the shore and it was back again with other fish in its stomach.

J. M. Macoun.

CERUSSITE FROM SALMO, B.C.

BY A. LEDOUX AND T. L. WALKER, ROYAL
ONTARIO MUSEUM OF MINERALOGY, TORONTO.

At the H. B. Mine, Salmo, B.C., where the principal ores are oxidised zinc minerals (silicate, carbonate and phosphate) cerussite is found in considerable quantity. The cerussite is not well crystallized as a rule but occasionally exceedingly beautiful crystallized specimens are encountered. The crystals are water clear with very brilliant faces and well suited for exact goniometric measurements. This probably is the finest crystallized cerussite found in Canada.

The crystals are almost invariably twinned forming six rayed structures such as have been frequently observed for this mineral. In these complex growths the twining ordinarily observed occurs on the face of the prism (110) but in the case of the Salmo mineral the structures are often more complex in that several of the individuals are twinned on (110) while one of these is twinned on another individual with (130) as the twinning plane. In many minerals complex twins involving more than one twinning law are common but in the past the stellate interpenetrating twins of cerussite had been regarded as resulting from twinning according to one law only until Hubrecht observed the participation of both twinning laws in the same complex group.* On groups of cerussite from Salmo the same complexity has been observed.

On crystals measured the following forms have been obseved:

(*a*) Pinacoids—
  Basal Pinacoid (001) usually rough and when present large.
  Brachypinacoid (010) always the largest face so that the crystals are tabular.
  Macropinacoid (100) narrow and well defined;

(*b*) Prisms—(110) and (130);

(*c*) Brachydomes — (012), (011), (021), (052), (031), (041), (092), (051), (061), (071), (081), (091), (0.10.1), and (0.12.1).
  The domes (012) and (021) are the most prominent. The others are present in certain crystals and give with the goniometer a long series of reflections;

(*d*) Macrodome—(102);

(*e*) Pyramids—(111) and rarely (112).

The ordinary form of single crystals is represented in fig. 1; it will be noticed that the faces are generally not very numerous. The more complex type of crystal is represented in fig. 2, where the development of numerous brachydomes is especially characteristic.

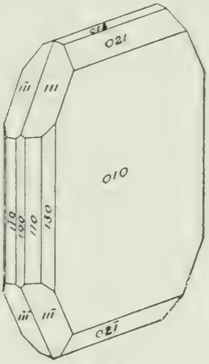


Fig. 1.

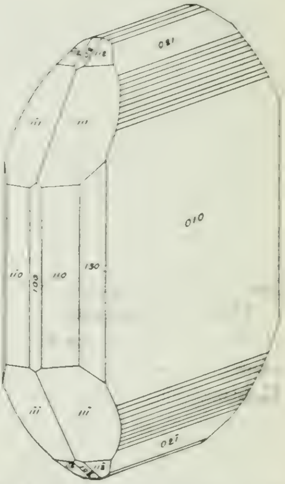


Fig. 2—The brachydomes lying between the faces (001) and (010) are as follows:—(012), (011), (021), (052), (031), (041), (092), (051), (061), (071), (081), (091), (010.1).

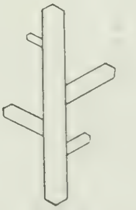


Fig. 3.

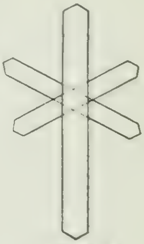


Fig. 4.

Repeated twinning on the unit prism (110) is very common, producing forms such as are represented by fig. 3 or 4. When this twinning law is the only one involved the angle between the *a* axes of successive individuals is 62° 46′. In the crystal represented schematically on fig. 5, the four individuals 1, 2, 3 and 4 are twinned according to this law, but a fifth individual (x) is twinned on No. 2 with (130) as twinning plane. The angle between the *a* axes of those two individuals is 57° 18′. The interpenetration of several individuals

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*Zeitschrift f. Kryst. XL p. 169.

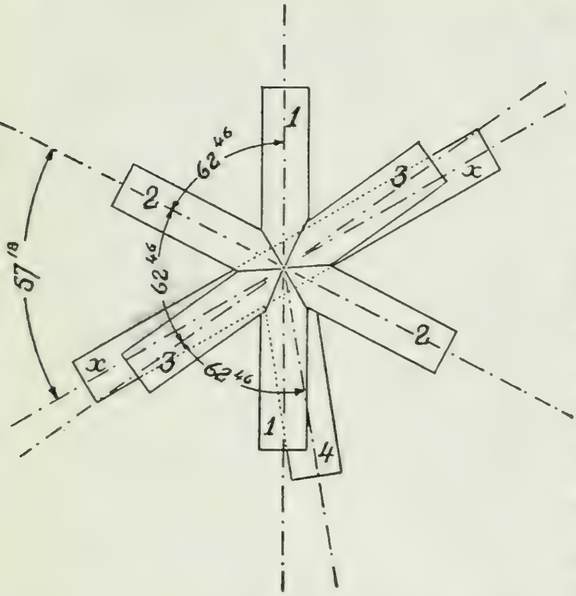

Fig. 5.

twinned according to different twinning laws gives rise to the formation of very complex groups.

The measurements were made by the two-circle goniometer; the measured values of φ and ρ compared with the calculated ones taken from Goldschmidt's Winkeltabellen for the following parameters are given below.

$a : b : c = 0.6100 : 1 : 0.7230.$

Face.	φ		ρ	
	Measured.	Calculated.	Measured.	Calculated.
001	—	—	0°	0°
010	0°	0°	90°	90°
100	89° 58′	90°	90°	90°
110	58° 39′	58° 37′	90°	90°
130	28° 36′	28° 39′	90°	90°
012	0°	0°	19° 54′	19° 52′
011	0°	0°	35° 53′	35° 52′
021	0°	0°	55° 20′	55° 20′
052	0°	0°	61° 3′	61° 3′
031	0°	0°	65° 16′	65° 15′
041	0°	0°	71°	70° 55′
092	0°	0°	73° 10′	72° 55′
051	0°	0°	74° 32′	74° 32′
061	0°	0°	77°	77° 1′
071	0°	0°	78° 49′	78° 49′
081	0°	0°	79° 45′	80° 11′
091	0°	0°	81° 2′	81° 16′
0.10.1	0°	0°	81° 57′	82° 7′
0.12.1	0°	0°	83° 25′	83° 26′
102	90°	90°	30° 38′	30° 39′
111	58° 39′	58° 37′	54° 16′	54° 14′
112	58° 39′	58° 37′	34° 42′	34° 46′

The brachydomes (092) and (0.12.1) have not been previously observed.

NOTES.

The American Musium of Natural History, we learn from its Journal, has offered to the National War Work Council of the Young Men's Christian Association the choice of any of its thousands of miscellaneous lantern slides which may be found suitable for the entertainment of soldiers in camp, either in this country or abroad. A cable received from France by the War Work Council asked for as many colored slides as possible, with a range of subjects embracing architecture, art, science, war and the scenery of various countries. The museum is preparing also a series of lectures to be circulated among the camps. Four of these now in course of preparation are: "Hunting Elephants and Other Big Game in Africa," by Carl E. Akeley; "Whale Hunting with Gun and Camera," by Roy C. Andrews; "Down the River of Doubt with Colonel Roosevelt," by George K. Cherrie, and "Bird Life on an Antarctic Island," by Robert Cushman Murphy.

The annual report of the Bristol Museum and Art Gallery, lately published, shows great activity, in spite of the war. During the year 261,594 persons visited the museum. An important new development was in connection with wounded soldiers. Some of the collections were temporarily placed in storage and space was made for a recreation center, including frequent lectures and demonstrations, concerts, library facilities and light refreshments.

Of the larvae of *Trogoderma tarsale*, a small beetle well known as a museum pest, experimented on by J. E. Wodsedalek, University of Idaho, Moscow, Idaho, the last of a large number of specimens lived, without a particle to eat, for the surprisingly long period of five years, one month and twenty-nine days or, to be more specific, from October 28, 1911, to December 25, 1916, a period of 1,884 days. Many of the largest larvae which were about 8 mm. in length dwindled down to practically the hatching length of 1 mm. before dying. When the starved specimens almost reach the smallest size possible and are then given plenty of food, they will again begin growing in size. Occasionally these larvae are found in large numbers in insect, seed and drug collections, and naturally destroyed as soon as discovered. Mr. Wodsedalek would appreciate living larvae or adults of other dermestids.

THE BEHAVIOUR OF THE RED SQUIRREL.

BY A. B. KLUGH, M.A., DEPARTMENT OF ANIMAL BIOLOGY,
QUEEN'S UNIVERSITY, KINGSTON, CANADA.

For the past eight months, that is from October to May inclusive, I have had a male Red Squirrel *(Sciurus hudsonicus loquax)*, under almost daily observation. The conditions for acquiring information on the normal behaviour of this species have been practically ideal. This squirrel is not tame and I have purposely refrained from any efforts to render it so, since conclusions drawn from the actions of a tame animal are of very doubtful value when applied to the species in the wild state. It has made its headquarters in a large sugar maple tree which grows beside the house, the main limbs of which are on a level with, and close to, my second-story verandah, while the tips of the branches are on a level with a window on the third story.

The reason why the squirrel selected this tree as its headquarters is not far to seek, as last year this maple produced an exceedingly bountiful crop of keys, which were lying thickly on the ground beneath it and on the roof, while all the other trees in the vicinity are soft maples whose keys had long ago germinated.

FOOD.

The main natural source of food supply of the squirrel has been the keys of the sugar maple; the second most important has been the buds of both soft and sugar maple. During April it consumed considerable quantities of buds, first of the soft maple and later, when the buds of the latter species had expanded, turning its attention to those of the sugar maple. After the leaves of the sugar maple were about one-third expanded it cut off a good many of the four-leaved sprays and ate the tender young stem, allowing the leaves to fall to the ground.

At the end of March, when the sap was flowing from broken twigs of the sugar maple and running down the under-side of the branches, the squirrel devoted most of its time to drinking sap. In order to get at this sap it had in most cases to hang upside-down, in the manner shown in Figure 1. When thus hanging from a small branch both fore and hind feet were clasped about the branch so that the toes nearly met on top of the branch. When hanging from a large limb its position looked a good deal more precarious, but it maintained its hold with ease and certainty, and though I saw it thus suspended from large limbs over a hundred times I never saw a single slip. When in this position it relied chiefly on its hind legs, and there was a decided bend outward in these legs at the tarsal joint, this bend evidently enabling the claws to catch the crevices of the bark more effectively.

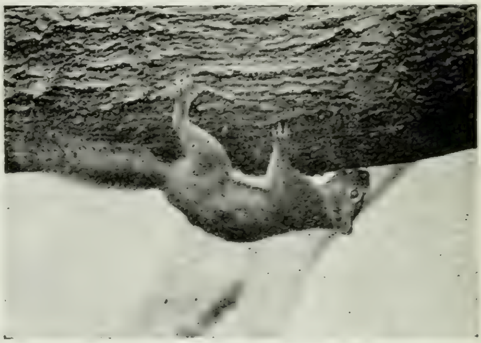

Fig. 1—Squirrel in position assumed when drinking sap.

When drinking sap it laps it up, its tongue going at a tremendous rate.

I have tried the squirrel with many different articles of food, such as meat, vegetables and nuts. For green vegetables, such as cabbage and celery, it has no great fondness. It likes meat, but its favorite food is undoubtedly nuts—hazels, walnuts, beechnuts and hickories. It also relishes sweet substances, as candy and jam.

MANNER OF EATING.

When eating anything which can be picked up it invariably takes it between its fore-paws, and sits up in the position shown in Figure 2. The position

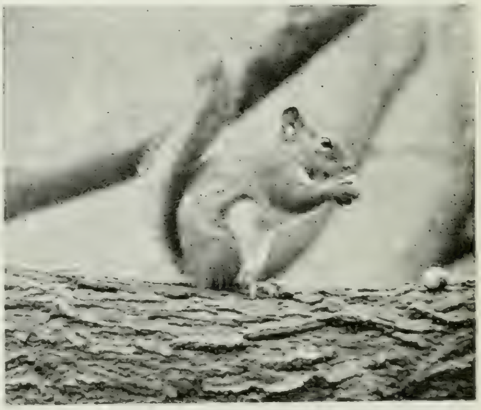

Fig. 2—Squirrel in characteristic eating attitude

of the tail when in this attitude varies a good deal, as it may be straight out along the limb, raised slightly from the limb and with a downward curve, or the basal portion resting on the limb and the apical half curved upward. But when it settles itself to consume something which will take some time to eat, it almost invariably elevates the tail straight in the air or applies it even more closely to the back. In eating a nut it first gnaws through the shell at a point just to one side of the apex, then breaks away the shell until it has consumed all the meat. In eating a beechnut it pulls one of the sides off with its teeth and then gets the kernel out whole.

STORAGE.

The squirrel practices three methods of storage—carrying things off to one of its main hoards, burying each object separately, and arranging them in a fork or on a limb. It classifies the things that it stores into two classes—hard objects and soft. Hard things such as nuts and seeds it either carries to one of its hoards or buries; soft things, such as meat, apples, etc., it arranges about the tree. It thus buries nothing which will mould or decay readily. It has several main hoards, though I only know the exact location of two, and when it is carrying off a number of things consecutively it takes them to two or more of these hoards alternately. When it buries a nut in the soil it scratches out a hollow with its fore-paws, places the nut in it, shoves it in as far as possible with its nose, and then covers it with a few swift strokes from right and left with the fore-paws. It performs this operation with much rapidity, but does it so well that when it has buried a nut in a location where there is moss and dead leaves there is no trace of any disturbance. In fact upon three occasions I noted the location of the spot at which I had seen it bury a nut as accurately as possible, but upon going to the place I was unable to find the nut.

During the winter its chief method of storage is burying in the snow. In doing this it shoves the object into the snow with its nose, then covers it with a few quick sweeps from right and left with its fully extended fore-paws. It will thus bury in the snow not only nuts and other hard objects, but also pieces of meat and small apples. That is, it treated them as hard objects, as indeed they soon were, being frozen solid in a short time.

CARRYING CAPACITY.

It is able to carry off objects of considerable weight, as the following instance shows. On the morning of May 11th, it entered the pantry through the open window. There it discovered a bowl of boiled potatoes, some of which it hid behind cans in the pantry, while it carried others up the maple tree and arranged them in the forks. Some of the potatoes which it carried up the tree weighed a quarter of a pound.

TUNNELLING UNDER THE SNOW.

When the snow became deep the squirrel made tunnels beneath it, first driving the tunnel which touches the tree, and later constructing the system of tunnels shown in Figure 3. During the winter I was able to judge somewhat of the extent of the tunnels from the positions of the exits, and when the snow thawed I was able to map them.

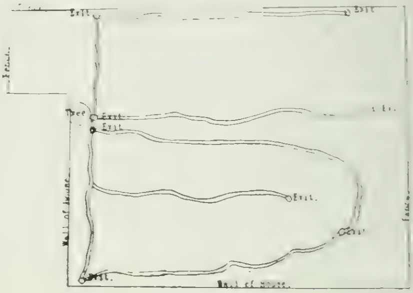

Fig. 3—Plan of tunnels of red squirrel under the snow.

The purpose of these tunnels was to gain access to the keys of the sugar maple which were so thickly scattered about the yard. The squirrel usually brought them to one of the exits to eat.

ACTIVITY IN WINTER.

It was out every day during the winter except in very stormy or in extremely cold weather. At such times it would not appear for two or three days at a time.

LEAPING ABILITY.

None of the leaps which I have seen it make seemed to tax its leaping power at all. A jump which it made often dozens of times a day in the winter was from the roof to the main crotch of the maple tree—a distance of eight feet with a drop of two feet. I noticed that it never tried the return leap, that is a leap which would land it two feet higher than its starting point, but always ran out on a limb and then to the roof.

In leaping it extends its legs and flattens its body, while the tail is straight and stiff behind it.

MANUAL DEXTERITY.

Though it lacks a "thumb" its dexterity with its fore-paws is much greater than in the case of most animals. By taking them between its paws it handles both large and small objects with the utmost precision and certainty. It can turn a smooth and slippery nut round and round in its paws and I have never seen it let anything slip. I have seen it reach out and pull off a bud with a single paw, folding the toes against the palm in doing so, and also place a piece of a leaf in its mouth with one paw.

BALANCING OF OBJECTS.

The squirrel is most expert in balancing objects on branches. Usually it selects either a crotch or the somewhat flat surface at the point at which a horizontal branch comes off from the limb as the place of deposition. When placing anything in position it shifts it a trifle to one side or the other with its paws or muzzle and does not leave it until it is as securely lodged as possible. It succeeds in balancing nuts in situations in which I should not like to undertake to balance them. I noticed that when it hung a long strip of ham-rind, an article of diet with which it can hardly have had previous experience, on a branch it shifted it until the two ends hung equally on each side of the branch. Out of the scores of times that I have seen it balancing objects I have only once seen it let anything fall, and upon this occasion it made a most strenuous effort to catch it but failed.

RESTING.

The squirrel does not often rest. It is almost ceaselessly active from early morning till dark, and during this time it is eating almost continuously. However it does rest, and even sleep, occasionally. Its favorite resting-position is spread out along a limb, with its legs out straight in front and behind and with its chin resting on its fore-paws. When it composes itself for a nap it hunches itself up, rests its chin on the limb, and flattens its tail down along its back. I have only once seen it go right off to sleep—as a rule its eyes are closed completely only for a moment at a time.

It has certain favorite places for resting, the most favored situation being on a rather small, nearly horizontal, branch at the point where it comes off from a larger branch. Here it sits with its posterior end against the larger branch in such a way that it gives one the impression that it "fits in" there.

I have seen it stretch—first one paw and then the other—and yawn. It often rubs its jaw and throat along a limb, in this respect reminding one very much of the actions of a cat.

WASHING.

After it has eaten anything sticky or greasy it licks its forepaws very thoroughly and then rubs them over its nose. It sometimes spends five minutes thus cleaning up.

SCRATCHING.

During the winter it did not seem to be troubled with insects, but in the early spring they apparently gave it a busy time. It scratched and bit itself very frequently and often for some time at a stretch, causing the shedding hairs of its winter coat to fly in all directions.

"FREEZING."

Upon two occasions when a hawk flew over, and upon another when it caught a sound like the scream of a hawk, the squirrel "froze", remaining absolutely motionless for three minutes or more. As soon as it moved it exploded into a loud and long-continued chatter.

PSYCHOLOGY.

In the study of any animal the most interesting thing, and at the same time the phase of the subject in which we have to proceed most cautiously in drawing conclusions, is its mentality. My close observation of the squirrel during the past eight months has given me some glimpses of the psychology of this animal.

The sense of ownership is a mental attribute which seems to be well developed. This squirrel appears to regard the sugar maple as its own private preserve. All through the winter it drove away any house sparrows which perched in it. Toward spring another squirrel sometimes came into this tree, and this always resulted in a great deal of barking and chattering, and ended in the retreat of the intruder, hotly pursued. This squirrel was also a male and was as large and apparently as strong as the "owner" of the tree, but it fled without putting up a fight. Once this second squirrel came into the tree when the "owner" was away, and finding some pieces of meat it proceeded to eat them in such a hurry that it choked.

The squirrel watches the things it has stored in the tree most jealously. Upon several occasions a white-breasted nuthatch has come and pecked at some of this food, and whenever this has been observed by the squirrel it has come on the jump and driven it away. Once the nuthatch came and pecked at a piece of meat, the squirrel drove it away, and then as the nuthatch flew the squirrel bounded over to another piece of meat as if it anticipated an attempt upon that piece also.

Does the squirrel know where it has placed things? This question has frequently been discussed and I can answer it most decidedly in the affirmative, as time after time I have seen it go by the nearest route to something it had stored and proceed to eat it. I am not prepared to say that it never forgets anything, indeed if it did not it would imply a far better memory than that of a human being.

Curiosity is an attribute which the squirrel exhibits to a marked degree. Any new object is at once seen, carefully approached and investigated. It seems as if the squirrel's method of investigation entails not only smelling a thing but trying it with its teeth. This certainly was the case with my camera. When it first saw it set up it was afraid of it, then it watched it as it passed it, then went up and smelled it and finally climbed on top of it and took a nip of the bellows, which was carrying it a bit too far from my point of view.

A couple of incidents which throw some light on the psychology of the squirrel I shall describe and let the reader draw his own conclusions.

One day the squirrel took a big piece of meat from which the fat had ben rendered, carried it to the edge of the roof from which it usually made its eight-foot leap, gathered itself as if about to jump, then checked itself, hesitated a moment, and then carried the meat up onto the roof of the verandah and thus to the tree. With small objects it always made this leap without any hesitation.

On May 15th, I placed a pile of apple-peelings and two small apples on a board which projected out over the roof. The squirrel was pulling at a long peeling when one of the apples rolled towards it and was about to fall off the board. It dropped the peeling and seized the apple just in the nick of time.

BRIEF REPORT OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING MARCH 19, 1918.

The activities of THE OTTAWA FIELD-NATURALISTS' CLUB during the 39th year of its existence, in popularizing and diffusing knowledge of the natural sciences, have been carried on chiefly in three ways: a course of seven lectures, twelve field excursions and the publication of THE OTTAWA NATURALIST which has now completed its 30th volume.

Thirty-two members were elected during the year making a total membership of 367. Twenty-one members serving overseas are carried gratis.

The lectures were planned to create a more intelligent interest in Canadian natural history and to give a better understanding of the value of scientific work. Through the co-operation of the Librarian of the Carnegie Library a programme for next season, covering the meetings of the various literary and scientific societies, will it is hoped be arranged, thus reducing to a minimum the conflict of dates.

The field excursions were announced in the daily papers in order that the general public as well as the club members might take advantage of them. Scientific men, both members of the Club and others at the request of the Club, attended the excursions to direct interest and answer questions.

The following are the officers and committees for the club year 1918-1919:

President, C. Gordon Hewitt; *Vice-Presidents*, M. Y. Williams, L. D. Burling; *Secretatry*, Clyde L. Patch; *Treasurer*, J. R. Dymond; *Editor*, Arthur Gibson.

Additional Members of Council: P. A. Taverner, F. W. Waugh, C. M. Sternberg, W. T. Macoun, G. A. Millar, Miss M. E. Cowan, Dr. R. M. Anderson, H. McGillivray, C. B. Hutchings.

STANDING COMMITTEES OF COUNCIL.

Publications—Clyde L. Patch, A. Gibson, P. A. Taverner, L. D. Burling, H. B. Sifton.

Excursions—F. W. Waugh, H. B. Sifton, C. M. Sternberg, G. A. Millar, Miss M. E. Cowan, C. L. Patch, H. McGillivray, C. B. Hutchings.

Lectures—M. Y. Williams, P. A. Taverner, L. D. Burling, W. T. Macoun, G. A. Millar, R. M. Anderson.

Membership—F. W. Waugh, A. Gibson, Miss M. E. Cowan, J. R. Dymond, P. A. Taverner.

Trust Funds—W. T. Macoun, C. Gordon Hewitt, H. M. Ami.

Auditors: J. Ballantyne, E. C. Wight.

LEADERS AT EXCURSIONS.

Archaeology: Harlan I. Smith, F. W. Waugh, W. J. Wintemberg, Dr. C. M. Barbeau, Dr. E. Sapir.

Botany: G. A. Miller, W. T. Macount, J. M. Macoun, Mrs. A. F. Brown, Dr. M. O. Malte, J. R. Dymond, E. C. Wight, H. B. Sifton, Miss M. E. Cowan.

Entomology: Arthur Gibson, Dr. C. G. Hewitt, J. M. Swaine, F. W. L. Sladen, C. B. Hutchings.

Geology: Dr. E.M. Kindle, Dr. M.Y. Williams, H. McGillivray, L. D. Burling, E. Poitevin, Dr. M. E. Wilson.

Ornithology: C. L. Patch, P. A. Taverner, Dr. M. Y. Williams, A. G. Kingston.

Zoology: Dr. R. M. Anderson, A. Halkett, E. E. Lemieux, E. A. LeSueur, C. H. Young, C. E. Johnson.

Photography: W. S. Hutton.

COLLECTING NOTES FOR NORTHERN SPIDERS.

By J. H. Emerton.

The most conspicuous northern spiders are the *Lycosidae*, which run on the ground and catch insects for food, without the use of cobwebs, taking shelter, especially in breeding time, in holes in the ground, or among plants, which they line more or less with silk. Some species, known to live as far north as Ontario and Manitoba, dig holes in sandy soil, and these may live farther north and should be looked for wherever there is sand only partly covered with plants. The hole usually has a perfectly round opening thickly lined with silk, to which sometimes sand and bits of straw are attached.

All spiders eat insects, but, as far as known, any spider may eat any insect which it can catch. All observations on choice of food by spiders would be useful, for instance, whether *Lycosida*e would catch Lepidoptera if the latter came their way.

The *Lycosidae* carry their eggs in a round silk bag attached behind to the spinnerets, and the young, after leaving the bag, hold for some time to the mother's back. The young hatch in midsummer and become half grown before winter, when they take what shelter they can find near the ground and remain torpid until the next spring, when they grow rapidly, maturing in June, the males before the females. The pairing takes place as soon as the females are adult, and this is the best time to collect them to be certain which males and females belong together. Many of these species are very variable and there is much doubt about their classification.

The distribution of many *Lycosidae* is extensive; for instance, *Pardosa glacialis* extends all over North America as far south as New York and Ohioward. *Lycosa pictilis*, under various names, extends along the Arctic coast from Siberia to Greenland, and south to Labrador, the White Mountains, Norway and the Alps. Specimens are desirable from as many places as possible.

Next to the *Lycosidae*, the most conspicuous spiders of the north are the very small species of *Erigone* and its allies, which live in enormous numbers close to the ground in small flat cobwebs which become visible only when covered with dew. These spiders are most readily found under stones and sticks lying on the ground. They also live in dead grass and litter of all kinds along the seashore and banks of ponds and rivers, and in the moss and decaying leaves that collect under trees and bushes. This loose material should be shaken and sifted on a large cloth, blanket or tarpaulin, the coarser parts thrown off and the dust carefully examined. I use a waterproof cloth three feet by six, and on this place an armful of litter, taking care to get the portion nearest the ground. This is beaten and shaken for a few minutes and the larger part taken away. The rest is shaken to the middle of the cloth and sifted in a sieve of three wires to an inch, which removes most of the straw, leaves and moss, and lets through the dust, insects, spiders, etc. Everything alive soon shows itself by movements as the various species recover from the shaking and become warm in the sun.

Epeira carbonaria, which makes round webs between bare stones in the Rocky Mountains, Labrador and the Alps, has not been reported from the Arctic coast, but should be looked for there on rock-covered hillsides above the shore. The spider is gray, like dark granite. It hangs in the middle of the web and drops at the slightest jar, but soon returns. Any cobweb should be watched in the evening, when the spider is more likely to expose itself. At other times the spider may be found in a nest at one side of, or above, the web.

A large number of spiders inhabit the spruce forest and extend across the continent. Many of these are found as far north as Hudson Bay and Alaska, but their northern limits are unknown. The most northern trees should be examined by beating them over a cloth laid on the ground well under the branches, and the falling animals picked from the cloth. Some of the tree spiders make large and conspicuous cobwebs and these should be examined in the morning when covered with dew, and, if possible, photographed then within an hour of sunrise.

Sphagnum does not usually shelter many spiders, but the moss which grows under trees and on decaying wood often contains many.

The leaves under birch and willow trees should be sifted, even if in small quantities.

It is expected that the new Field Museum, Chicago, for which ground was broken in the summer of 1915, will be ready for the transfer of the contents of the old museum in Jackson Park by August, 1919. The new building is situated south of Twelfth Street and east of the Illinois Central Station. It is of Georgia marble, and, exclusive of the porticoes, will measure 756 feet long and 350 feet wide. It will cost $5,000,000.

THE RELATIONSHIP OF THE FOSSIL MARL FAUNA OF MACKAY LAKE, OTTAWA, TO THE PRESENT MOLLUSCAN FAUNA OF THE LAKE.[*]

By E. J. Whittaker.

Physical Features of the Lake.

MacKay or Hemlock Lake is a small body of water in Rockcliffe, just east of the city of Ottawa. It is irregular in shape, about 500 yards in length and 215 yards in greatest breadth. The long axis of the lake runs approximately north and south. One eighth of the total water area is occupied by a deep bay indenting the eastern shore to a depth of 150 yards. The surface of the lake is 15 feet above the Ottawa River and its greatest depth is only thirty feet. The history of this basin dates back to the end of the Pleistocene, when the land was emerging from the Champlain sea. The shore on the west side consists in part of bedrock of Chazy age, while on all other sides are marine sands and clays and some small areas of recent deposits. The topography about the lake reflects these two contrasting types. In the part of the lake enclosed by bedrock the shores are high, small ramparts of sandstone outcrop, and there is a complete absence of peaty or mucky deposits. Elsewhere the shores are low and owing to their boggy nature the water cannot be approached on foot. A small area at the extreme southern end where the muck deposits are absent, is the only exception.

At the south end there are two small rills which form the only visible inlets to the lake. A considerable volume of water is brought down by them in time of spring flood, but in summer they are nearly dry, and the only supply comes from seepage and springs from the surrounding land areas. As this is inconsiderable in amount, the water becomes quite stagnant. The waters of MacKay Lake find an outlet through a small stream, half a mile in length, which flows into the Ottawa. This creek has cut a valley from 25 to 40 feet deep and from 80 to 100 feet wide at the top through the Pleistocene clays. Originally, on the emergence of the land from the Champlain Sea, the erosion must have been very rapid through this soft unconsolidated material. At the present time, however, owing to the insignificant volume of water carried the bed of the stream is being lowered very slowly. Its erosive power is further diminished by the abundance of water plants over much of its course.

Though of small extent, the marl deposits of MacKay lake have been known for a long period.[**] They are very accessible, and new parts of the beds have been constantly brought to view as further advances were made into the sand beds which they overlie. The elevation of the marl beds above the present level of the lake is 18-20 feet, and is without doubt due to the lowering of the lake since their deposition by the cutting down of the outlet. This erosion must have occupied a considerable period of time. Formerly the lake must have been somewhat larger than now, although, at present, the deposits of marl are found only at the south end of the lake, at a distance of about 100 yards from the water. Elsewhere, presumably, the beds have been removed by erosion. The marl is from three to five feet in thickness and is overlain by a small amount of superficial soil and peaty matter on which grows a luxuriant forest of both large trees and undergrowth, whose roots have filled the beds with a network of interlacing fibres. The underlying material is for the most part sand, which frequently shows cross-bedding, and is occasionally replaced by heavy gravel or boulder—suggesting that these lower beds are of fluviatile origin.

The marl was formerly used in making brick and cement but is not being worked at the present time. In appearance it is yellowish-white to pure white, but is occasionally rust-stained from overlying deposits. It is very slightly coherent, crumbling readily between the fingers, and a block placed in water will break down like loaf sugar. It consists of a large proportion of fresh water shells well preserved in a matrix of almost impalpable powder which is not made up of shell fragments as in the case of many marls. Its origin will be discussed later.

A chemical analysis made in 1894[*] shows over 93% of calcium carbonate, and nearly 5% of organic matter such as root fibres and humus, indicating a very pure marl.

The Faunas.

The fresh water shell remains in the marl of MacKay Lake are the most modern fossils in the area and belong to a late Pleistocene or early

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[*] Published by permission of the Director of the Geological Survey of Canada

[**] Geol. Survey of Canada Report 1845-46, p. 96.
Report of Progress, 1863, p. 765.
Annual Report 1893, vol. VI, p. 70AA.
Annual Report 1894, vol. VII, pp. 23, 24R. (Chemical analysis).
Annual Report 1899, vol. XII, p. 47.

[*] Annual Report, Geol. Survey of Canada, 1894, vol. VII, pp. 23-24R.

Recent fauna. The fauna is somewhat younger than the Pleistocene fauna on Cayuga Lake described by C. J. Maury.[†] They occur very uniformly distributed throughout the beds. They can be picked up where the marl has weathered out, or can be procured by thousands if a block of unweathered material is soaked in a pail of water. Many of the shells contain quantities of air and, as the block disintegrates, they rise to the top and can be poured off into a sieve. In this way several thousands of specimens were procured for study. The original coloration of the shells has disappeared and they are white and opaque except in two species—*Valvata tricarinata*, which still retains in many cases a tinge of green, and *Physa heterostropha*, which retains a red band inside the callus at the aperture of the shell. The specimens are perfectly preserved for study, as the finest striae remain unabraded.

Along with the fresh water shells were found, rarely, several species of terrestrial gastropods that had evidently been carried into the lake by small rills or in the case of minute delicate shells, by the wind, and deposited with the fresh water forms. As terrestrial shells are rare in the marl and no very definite relationships to living forms can be established in their case, they are not further discussed here.

MacKay Lake with its somewhat stagnant water is not an especially good habitat for the Mollusca and yet we find a considerable assemblage of forms thriving it in. Many of these forms also occur fossil and the following table shows the species common to both. These two lists show a very marked contrast in the composition of the living and fossil faunas of the lake. It may be added that the list of the present fauna is not complete; to make it so would necessitate a larger series of dredgings than it was possible to make at the time.

MARL FAUNA.	PRESENT FAUNA.
GASTROPODA.	
Limnaea galbana[*]	*Limnaea stagnalis appressa*
Planorbis companulatus.	*Planorbis companulatus.*
Planorbis bicarinatus.	*Planorbis bicarinatus.*
Planorbis parvus.	*Planorbis parvus?*
	Planorbis trivolvis.
	Planorbis deflectus.
	Planorbis exacutus.
	Planorbis hirsutus.
Physa heterostropha.	*Physa heterostropha.*
Amnicola porata.	*Amnicola porata.*
	Pomatiopsis lustrica.
Valvata tricarinata.	*Valvata tricarinata.*
	Campeloma decisum.
PELECYPODA.	
Pisidium abditum.	*Pisidium abditum.*
	Lampsilis radiatus.
	Lampsilis luteolis.
	Sphaerium simile.
OSTRACODA[**]	
Cypris sp.	
Several other species.	

It will be seen that seven species only can be used for comparison between the living and fossil forms. Each of these will be taken up in detail to note what differences, if any, have arisen since the deposition of the marl beds. In the case of gastropods, four sets of measurements were made in the following order: (1) Height of shell, (2) Width of shell, (3) Height of aperture, (4) Width of aperture. In the case of the pelecypods, length, height and width were noted. Measurements were made of a series of average individuals and the means of these taken as the measurements of the species. As conditions in MacKay Lake may not be favourable to the growth of a completely normal fauna, the measurements are added of the species recorded by Mr. Frank Collins Baker[***] from the region about Chicago, where the conditions are very favourable to molluscan life and individuals may be expected to reach a normal size.

The method employed in determining the measurements was as follows: The specimens of one species were placed on a smooth surface. A straight edge was then pushed through the shells and a dozen or more were separated from the rest and arranged in a row along the rule. This process was repeated until all the specimens were arranged in rows. The individuals at each end and the one in the middle of each line were measured. For instance, if one line contained seventeen shells, numbers 1, 9, and 17 were selected for measurements. Means were calculated for each species. In this way it was thought a fair average would be obtained in lieu of measuring hundreds of specimens.

A second method secured some additional data, and also acted as a check on the first. The shells were spread out and eight of the largest normal individuals both of the living and fossil forms selected and measured. It was found that the measurements taken in this way were slightly greater than those obtained by the first method, but that the ratios of living to fossil forms agreed very closely. In the tables given in this paper the results obtained by the first method are used except where otherwise noted.

[†] Interglacial fauna in Cayuga Valley, Jour. of Geol. 1908, vol. XVI, pp. 565-567.

[*] H. M. Ami lists Limnaea stagnalis and L. dedidiosa from the marl beds, Vol. XII, p. 56G, Ann. Rept. Geol. Surv. of Canada.

[**] None previously recorded from these beds; all are probably new.

[***] The Mollusca of the Chicago Area, Chicago Acad. Sciences, Bull. No. 3, Nat. Hist. Survey.

1. *Planorbis companulatus* Say

	H.	W.	A.H.	A.W.*
a. Marl from MacKay Lake	5.18	9.2	4.56	3.69
b. Living form, MacKay Lake	6.27	11.4	5.5	4.56
c. Form in Chicago area	6.63	12.75	5.19	4.69
Ratio b:a	1.211	1.245	1.226	1.238

or an average ratio of 1.23.

In the case of *Planorbis companulatus* we have thus conclusive evidence that the present form is considerably larger (23%) and that the environment of the fossil species was not very suitable to it. But apart from the size the species has not changed at all. The ratios of the four standard measurements are nearly equal showing that the proportions of the shell have remained practically the same. The shell ornamentation remains unchanged also.

2. *Planorbis bicarinatus* Say

	H.	W.	A.H.	A.W.
a. Marl form, MacKay Lake	4.94	8.75	4.15	3.5
b. Living form, MacKay Lake	4.75	7.83	4.17	2.917
c. Chicago form	5.75	10.63	5.13	3.88
d. Form from Presqu'ile Bay, L. Ontario	6.08	11.33	5.25	4.16
Ratio c:a	1.164	1.215	1.231	1.09

Analysis of the above figures shows that in this case the fossil specimens are slightly larger than the living forms, a conclusion not in harmony with the previous result and, as we shall see, also differing from that reached for the majority of the species. Apparently the quiet water of Mackay lake is not well suited to *Planorbis bicarinatus*. The two broadly funnel-shaped depressions in both sides of the shell expose a very large area to erosion by carbon dioxide, which the water contains in considerable amount. Such erosion is a constant drain on the vitality of the animal, as the lime of the shell must be constantly renewed. We have also abundant evidence that the marl forms themselves were not well adapted to their environment. They show an extreme variation in the shell:—the aperture varies from sub-trigonal to sub-ovate; many specimens show traces of former apertures, as evinced by transverse thickening of the shell at one or more places in the body whorl accompanied by a change in direction in the latter; fully fifty per cent. of the specimens examined show distinct minute revolving lines occurring irregularly over the shell; the shell is also thickened unevenly about the aperture. Specimens from Presqu'ile bay, Lake Ontario, do not show any such irregularities. That the slight diminution in size of the specimens found in the lake as compared with those from the marl is local and is not a constant feature, is indicated by the measurements from the Lake Ontario and Chicago specimens. That the marly bottom of the ancient lake was not very suitable to this form, is evident from the presence of so many abnormalities in the individuals, but it was a little more suitable than the present lake.

3. *Plenorbis parvus* Say. The fossil form is variable in size. It is impossible to give an exact series of measurements but the average is lower than those of the living forms to-day. This species is found in considerable numbers in the marl bed but is not nearly so abundant as *Valvata tricarinata* and *Amnicola porata*.

4. *Physa heterostropha* Say.

	H.	W.	A.H.	A.W.
a. Marl form, MacKay Lake	11.38	7.38	8.69	4.08
b. Living form, MacKay Lake	12.88	8.13	9.75	4.61
c. Chicago form	13.50	8.67	10.17	4.33
Ratio b:a	1.132	1.102	1.122	1.111

In the case of this species the living form is somewhat larger than the fossils. The ratio agree closely. *Physa heterostropha* shows with the other species the adverse influence of the marly bottom. The fossil form retains some of the original coloring matter in a red band inside the callus at the aperture.

5. *Valvata tricarinata* Say.

	H.	W.	A.H.	A.W.
a. Marl form, MacKay Lake	2.7	3.9	1.8	1.65
b. Living form, MacKay Lake	4.41	5.47	2.67	2.28
c. Chicago form One specimen only.	4.00	4.00	2.00	2.00
Ratio b:a	1.65	1.40	1.48	1.39

Of all the species discussed in this paper *Valvata tricarinata* shows the greatest difference in size between the present and fossil specimens. The linear measurements show that the bulk of the living animal is more than twice the size of the fossil form. This species occurs in great abundance in the marl beds and is uniformly small. The marl specimens might be considered a dwarf variety of the species which adapted itself to an unsuitable bottom environment. Many of the shells are slightly green in colour.

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*H.—height of shell in millimeters.
W.—width.
A.H.—aperture height.
A.W.—aperture width.

6. *Amnicola porata* Say.

	H.	W.	A.H.	A.W.
a. Marl form, MacKay Lake	4.2	3.5	2.23	1.75
b. Living form, MacKay Lake	4.2	3.62	2.1	1.73
c. Chicago form	5.00	4.25	2.8	2.08

These figures show that a. and b. are practically identical in measurements.

This species has not changed at all in the area under discussion but neither its marl environment nor its present one in MacKay Lake have allowed it to attain its maximum growth. This is seen by comparing them with normal forms from the Chicago area which are much larger as shown by the figures above.

7. *Limnaea galbana* Say was first described as a fossil and has since been found living. It was not found living in MacKay Lake. The specimens from the marl beds average a little larger than Say's type. This species is such a persistent member of the marl bed faunas throughout the Northeastern United States and Canada that it seems especially fitted for such a habitat. The living species prefers clear water more or less in movement, which fact probably excludes it from the lake at present.

8. *Pisidium abditus* Haldeman.

	Height	Width	Length
a. Marl form	2.25	1.96	2.62
b. Present form	3.25	2.83	4.03
c. Chicago form	Measurements not available.		
Ratio b:a	1.44	1.44	1.54

P. abditum is the only pelecypod found common to the fossil and present faunas of MacKay lake. The figures above show the present form to be much larger than the fossil shell.

It is interesting to consider for a moment the pelecypod fauna. *Pisidium abditum*, the only representative in the marl, is uniformly small, and, though fairly abundant, is not comparable in numbers at all with the gastropods. In the present lake fauna *Lampsilis radiatus* and *L. lueolis* are found but in small numbers, and not far from the outlet. These members of the Unionidae cannot thrive apparently in stagnant water. On the other hand, the members of the Sphaeriidae, represented by *Sphaerium simile* and the species of *Pisidium* are to be found in fairly large numbers in these waters.

DEPAUPERATION.

An examination of the data for the species discussed above shows all the fossil forms with the exception of *Amnicola porata* and *Planorbis bicarinatus* to be smaller than their existing descendants in the lake of to-day. Even these exceptions are smaller than normal. The tables show that exclusive of ostracods only eight species are common in the marl beds while sixteen are found in the present lake and this number would be exceeded if an exhaustive search were made. What caused the depauperation of the marl bed fauna? As noted above it seems probable that the bottom environment had a great deal to do in this connection and that the marly bottom was very unfavourable to most of the species. No marl is being deposited in the lake at the present time. But in the shallow bay to the east the bottom is composed of this material. This represents either an old marl bed in situ below water level or the accumulated wash from higher beds. The water is seldom more than four feet in depth in this bay. A very small amount of muddy sediment overlies this marl and is covered by a scanty aquatic vegetation consisting mainly of algae. The molluscan life in this area is scanty, few living shells were obtained, and these were mostly the ubiquitous species *Valvata tricarinata* and *Amnicola porata*. The latter was mostly found attached to the submerged plant stems and comparatively few were found on the bottom itself. *Pisidium* can live attached to algae and other aquatic plants, and thus remain somewhat away from the influence of the marl. The heavy shelled forms like the Unionidae, however, must live directly on the bottom. The marl acts unfavourably on such species probably by clogging their gills. It is not surprising therefore, that these forms are entirely wanting in the marl fauna.

In contrast, on the western side of the lake there are two different types of bottom, one composed of soft mud with an abundant plant growth, while the other is composed of rock covered with debris both organic and inorganic. The first named area provided every species obtained in the lake in great abundance except *Campeloma decisum*, *Lymnaea stagnalis*, and *Planorbis trivolvis*. The two latter species were found here also but were attached to submerged objects and not on the bottom. The rock covered with debris had also a considerable fauna—much greater than that of the marl beds in the eastern bay so it seems that here at any rate the marl bottom is perjudicial to a flourishing molluscan fauna. The marl bottom is not conducive to growth of many water plants. Certain algae and other low forms are the most common. Such species as *Amnicola*, small forms of *Planorbis* and *Valvata* can attach themselves to these algae but prefer lily stems and pads and other plants with vigorous stem and leaf growth.

As mentioned above the marl matrix is not composed of shell fragments but of a fine impalpable powder of calcium carbonate. Two theories have been propounded to account for such a type of deposition. Both consider the lime to have been precipitated from solution by various agents. The older hypothesis holds that the high percentage of carbon dioxide in spring water is reduced when it enters the lake. As a consequence, the calcium carbonate, which has been held in solution through the presence of the excess carbon dioxide, is precipitated. The other theory attributes the same result to the work of algae which remove the carbon dioxide. It is quite possible that both agencies have been operative at MacKay Lake; but, however precipitated, the marl in a finely divided state, would be injurious to the molluscan fauna and account for its depauperation.

Another factor which no doubt must have exerted considerable influence in this connection was the colder climate which probably existed when the marl was accumulating. Such conditions would tend to make short thick shelled forms with the vital organs concentrated as much as possible. A glance over the marl fauna shows this to be conspicuously true. *Valvata, Amnicola*, the represented species of *Planorbis*, all belong to this class. *Lymnaea galbana* with its shouldered thickset whorls is a remarkable contrast to *Lymnaea stagnalis appressa*. *Planorbis trivolvis* a large thin shelled species is missing from these marl beds.

The marl of MacKay Lake, therefore, seems to have a depauperate fauna due to an adverse bottom environment and, probably, to a cold climate. It would be interesting to note if, in other districts, similar results could be obtained from a comparative study of the fossil and recent forms. MacKay Lake, however, lends itself particularly well to this kind of study as the marl beds are in such close proximity to the lake. Instructive results would probably be obtained if the fresh water fauna of the Toronto formation were subjected to this type of study.

NOTE—The writer wishes to gratefully acknowledge the valuable assistance and suggestions received from Dr. E. M. Kindle of the Geological Survey of Canada.

The Division of Exhibits of the United States Food Administration, Washington, offers to assist any museum to develop a special exhibit to illustrate the need of conserving foods. A handbook of "Graphic Exhibits" has been printed. Mimeograph copies of plans for larger exhibits have been prepared. Copies have been secured of a series of 13 charts, designed and written by Elizabeth C. Watson, under the title, "Why Food Conservation is Necessary." All these are sent to any museum upon request.

MOST UNUSUAL DEER HEAD WITH EYE TEETH.

The White-tailed Deer (*Odocoileus virginianus*), is well known as a bearer of great variations. The horns of the older animals exhibit many freak forms but it is not usual that a natural freak is seen in a young deer. The following note is of a freak in a young deer not over four years old and refers to the teeth and not to antlers, in which there are "eye teeth" or tusks (quite well developed for the age); both are evenly matched and slightly curved back, standing out from the jaw about three-eighths of an inch. A characteristic of the deer family is the absence of front teeth in the upper jaw, the only exception being found in the Elk group (*Cervus*), which when over four years usually develop eye teeth in the male sex only. Taking the formation of teeth in all the larger animals, the majority still carry the eye teeth, or show signs that they did in generations of long ago, and I conclude, therefore, that the deer family also had normal teeth in earlier times so it would be hard to say just how many generations this little deer has been thrown back to his former ancestors. I enquired at the Victoria Memorial Museum, Ottawa, if the officers there had ever known of this freak before and the Director replied that he could find no previous record. I also wrote to the U.S.N.M., Smithsonian Inst., Washington, D.C., and was informed that it is of most unusual occurrence, though they have one from Arizona. I gather, however, that the Arizona record is the only one they know of, but, in this, I may be mistaken. The specimen here recorded was killed near Yahk, B.C., in December 1917, and now forms part of my collection.

C. GARRETT, CRANBROOK, B.C.

As an example of the possibilities of economic zoology, it is interesting to report that the U.S. Biological Survey which has long been engaged in the control of rodent and other pests in various parts of the country, has detailed a staff to France to make similar attempts against the rats that infest the battlefields. These animals, disgusting in themselves, are also a source of danger to the trenches by their habits of undermining and to the troops owing to the food and material they destroy and their potential possibilities as disease carriers. Should even partially effective means of control be evolved they will demonstrate the practical value of scientific research in a most convincing manner.

THE EVENING GROSBEAK (*Hesperiphona vespertina*) at ARNPRIOR, ONT.

By A. L. Gormley.

During the past few years bird-lovers of eastern Canada and the north-eastern United States have enjoyed an annual winter visit from the Evening Grosbeak, one of the most interesting and most beautiful species of our boreal birds. For five consecutive years, from 1912-13 to 1916-17, it was a regular winter resident at Arnprior, sometimes coming in large numbers, and I had every opportunity of observing and studying its habits. I distinctly remember having seen the Evening Grosbeak before 1912, but being a boy at that time, I had not sufficient interest in birds to keep records of their going and coming. During the winter, when avian life is little in evidence, the beautiful plumage and robin-like call of the Evening Grosbeak is sufficient to attract the attention of the most unobservant person, and many were the explanations given for their presence at this season, when all birds are commonly supposed to be happily sojourning in the sunny south, free from scarcity-of-fuel problems. One man who spoke to me about them, even went so far as to say that he thought they were European birds driven from their native home by the war; while another stated that he was certain the birds of this country had greatly changed since the time he was a boy. Such distinguished visitors at once gained the good-will of all nature-lovers and several people succeeded in getting them to come to their bird "cafeterias" to feed.

While here they feed almost exclusively on the fruit of the Manitoba maple (*Negundo aceroides*) and occasionally visit the sumacs. They eat a lot of snow, and I have often seen them fly to the rain-gutters on houses, presumably looking for water. Although they are somewhat pugnacious during the winter, they become much more so when spring arrives. At this season they also become much livelier and spend considerable time flying after one another, generally the males after the females. Compared to the Hermit Thrush or some of our more brilliant songsters, I have never heard anything from the Evening Grosbeak that could properly be called a song, but during the month of May especially, they certainly make a lot of noise, the whole flock usually "singing" together. Following the general rule, however, in regard to bright plumaged birds, it seems that nature has not endowed them with any great gift of song. As the snow disappears, they eagerly search the ground for bits of gravel, etc., and should a pool of water be near at hand, they will often be found clustered about its edge, merrily drinking and bathing, as, like most birds, they are very fond of water. By the first of May, they are generally all mated, and they then forsake the maples for the evergreens, preferably the cedars, where they spend much time chattering noisily, as if discussing the hardships of the past winter. Although they still remain in flocks, each male now keeps close watch over his mate, so that the pairs tend to keep more by themselves, especially when feeding. Last spring, when they remained until May 21, I had strong hopes that they would breed here, since so far as I know, the nidification habits of the species are as yet a mystery; but they all suddenly left and none have appeared since.

It seems to be a general rule with our winter migrants, that, after visiting the east in increasing numbers for a few years, they suddenly reach a period of maximum abundance, after which they practically disappear, for some time. Such seems to be the case with the Evening Grosbeak. During the winter of 1916-17, they were very abundant here, and were reported from many places in Ontario and the northern United States. During the past winter, however, they have been entirely absent, although as far as this district is concerned, their favorite food has been plentiful. They may, of course, re-appear next winter, but it is quite probable that they will not be seen here for a few years to come.

The following is a list of the dates of arrival and departure, etc., for the past five years:—

1912-13.—Arrived December 31 and soon became common. During January and February several large flocks were seen, but they gradually diminished in numbers, until only twelve were observed on March 2. These remained until May 5, when they all left.

1913-14.—Arrived on November 16, when four were seen. Gradually increased in numbers, until twenty were observed on January 4th. Remained common until May 1.

1914-15.—Very few were seen this winter. Three arrived on January 12, and eleven were seen on February 3. According to my notes they were absent until April 5, when three appeared. None were seen after this.

1915-16.—This was another off-year. Although sixteen arrived on December 5, the largest flock seen after this was five, but they remained until May 20.

1916-17—More Evening Grosbeaks visited Arnprior this winter than ever before, perhaps more than in the preceding four years together. On October 29, the earliest date on record, fifteen arrived. They steadily increased in numbers until December 24, when at least sixty were seen. During January they gradually decreased but returned again on February 10, when about one hundred were seen. As many others were reported from the surrounding district, this year's migration easily surpassed all the others of which I have record. They remained common until May 21, when all disappeared. As they were here from October 29 to May 21, their breeding grounds cannot possibly be very far north.

1917-18.—Although their favorite food was abundant last winter, not a single bird has been seen or heard of up to this date (April 1). In Bird-Lore's 1917 Christmas Census, there is a single record, viz: Benington, Vermont, but I am inclined to doubt the correctness of this, as it is the only record from all the north-eastern States and eastern Canada.

A PROTECTED NEST OF THE BALD EAGLE.

By W. E. SAUNDERS.

(Read at a Meeting of the McIlwraith Ornithological Club.)

On April 15th, 1916, I had the privilege of visiting the nest of a Bald Eagle on the farm of Mr. J. W. Gilbert on the lake shore west of Tyrconnell. Mr. Gilbert has taken a personal interest in this bird and his neighbors understand that he values its company and does not wish the birds to be shot. Consequently, it is no surprise to learn that they have nested in his woods for twenty-five years and that the memory of the oldest inhabitant proves that eagles have nested within three or four hundred yards of the present location since the first coming of the whites to Ontario.

For many years the birds were in an enormous chestnut tree which blew down about 1908, when they moved to the north side of the woods where they now are.

The 1916 nest is in a very large buttonwood tree thirteen feet in circumference and is placed in the highest available position, which I judge to be at least ninety feet from the ground. Less than 100 yards away is another nest which was used for perhaps only one or two seasons and then abandoned, possibly for the reason that the limb on which it was placed was dead and, therefore, dangerous. It is in an elm on an ascending branch which angles and curves a good deal as it rises and, therefore, looks as though the birds were justified in leaving it.

Some years since, Mr. Gilbert cut down the north end of his woods, leaving the eagle tree somewhat isolated, but this has made no difference in the use of that tree by the birds.

The size of the present nest would indicate that they have used it for six or eight years at least and the tameness of the female bird proves clearly that she has been protected. Mr. Gilbert met us on the road opposite the nest and as we went in the bird flew when we got within seventy-five yards of the tree, but while she scolded she was evidently not alarmed and by the time we got under the nest she settled in the tree and after circling a few times more she went directly on the nest while we were beneath it. She seemed to consider it outrageous when I rapped on the tree to request her to get off, and she complied in a very noisy manner but she soon lit in the tree again.

Doubtless the eggs were very near hatching or had hatched as these birds are supposed to lay in March and after the incubation period the young remain in the nest for a couple of months.

Six years ago one of these birds was shot in the spring and Mr. Gilbert was afraid that he was going to lose his eagles after all as the remaining bird left almost at once, but after having been away for four days it returned with a new mate to the great satisfaction of the owner of the wood.

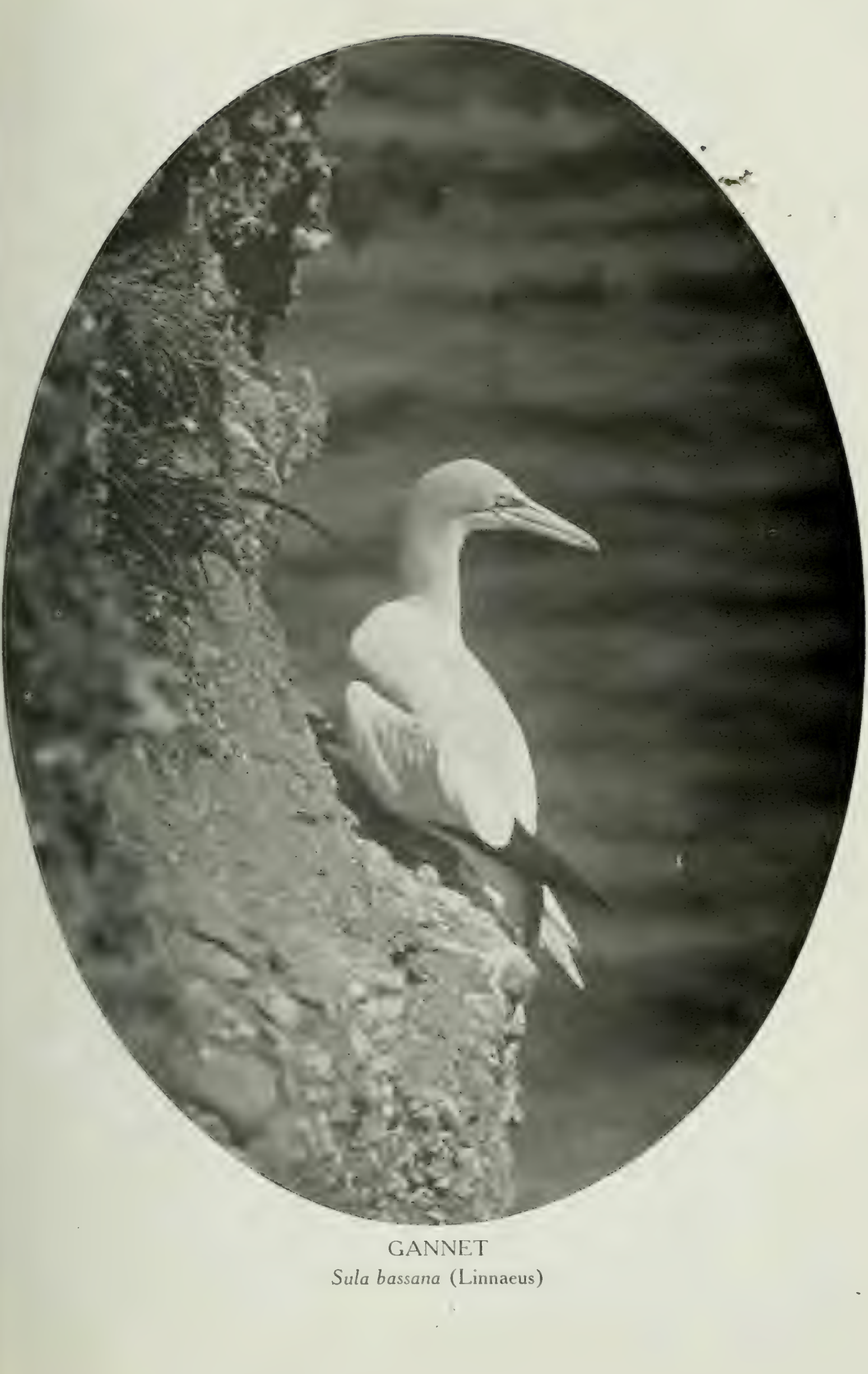
I questioned him about possible injury to fowl from the presence of these birds but he had not noticed any at all. Moreover, he said that he was so interested in the birds and they were such a joy to see in the air that he thought that if they did take a chicken even as often as every month or two during the year, such loss would not be a high price to pay for the enjoyment he got from their presence.

The food of these birds consists almost entirely of fish which they pick up on the lake shore a quarter of a mile distant.

All through the country along the north shore of Lake Erie eagles formerly nested at intervals of only a few miles but a great many of these have been killed by misguided effort and there are not many of them left.

It would have been well if the Ontario Government had included large and spectacular birds like this species in their recent legislation protecting the game birds for the next few years.

The Forestry Branch of the Dominion Department of the Interior has just issued Bulletin No. 63 on Wood-Using Industries of Quebec. This is a valuable contribution of 89 pages and is published in both French and English. It has been compiled by Messrs. R. G. Lewis and J. A. Doucet. Application for the bulletin should be addressed to The Director of Forestry, Department of the Interior, Ottawa.



GANNET
Sula bassana (Linnaeus)

THE OTTAWA NATURALIST

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THE GANNETS OF BONAVENTURE ISLAND.*

By P. A. Taverner.

Of the great Gannet colonies that at one time dotted both east and west coasts of the North Atlantic but few now remain. There are several surviving colonies around the British Isles, notably on the Bass Rock from which the species obtains its specific name, *Sula bassana*, and Iceland still has a rookery or so but in the new world the species is now reduced to two localities, Bird Rock, near the Magdalen Islands, and Bonaventure Island, off the Bay of Chaleur side of the Gaspe Peninsula. The Bird Rock rookery lying out in the middle of the gulf is difficult of access, but Bonaventure Island within three miles of the mainland and the village of Perce is easily reached and is one of the natural wonders of eastern Canada.

Any small scale map shows the great indentation of the Bay of Chaleur in the south shore of the Gulf of St. Lawrence. The land projection separating it from the main body of the gulf is the Gaspe Peninsula and just inside the extreme tip lies the village of Perce with Bonaventure Island just off the coast and forming a partial shelter to its anchorage.

Perce is noted for several reasons. As one of the oldest settlements on the coast, it was the headquarters of an old and important fishing company and hence the supply centre of the surrounding country before the railroad came, reorganizing old systems of distribution. With Mount Saint Anne towering behind it and flanked by the giant walls of the Murailles rising from the sea, it is one of the few spots in eastern America where sea and mountain scenery combine in a single landscape and, whilst the heights are not as overpoweringly impressive as in the mountains of the far west the scene is vigorous and satisfactory to eastern eyes. Just off shore from the village lies Perce Rock a striking monument to geological history. A great lone rock mass sheer and straight on every hand, some twelve hundred feet long by three hundred high; pointed and highest at the shore end and no more than eighty feet through for the rest of its length, recalling the hull of a great ship that has just left the ways and is taking its initial plunge into the sea. In the centre of the seaward half is the great arch that has given it and the adjoining village its name. Eighty feet from spring to spring and of an equal height, it pierces clear through the rocky mass and frames a view of blue sea and sky beyond.

With these scenic advantages alone Perce should be famous, but adjoining is Bonaventure Island and the bird rookeries on its outer or seaward face. The island itself is roughly circular in outline and about three miles across in its greatest dimension. On part of the main land side the steep shores are broken down to the sea level but everywhere else they are steep unbroken rocky cliffs rising on the seaward face some three hundred feet straight from the sea. Here are the bird rookeries.

Approaching this side from the sea, one is aware that every ledge and shelf is covered with white as though snow had piled in drifts upon them allowing only the overhangs to show dull red between the glistening surfaces. A wind seems to stir the white masses, and they blow off in eddies and clouds of drifting flakes that finally resolve themselves into great white birds that swirl about the cliff faces and circle round the intruder amid a pandemonium of hoarse cries. These are the Gannets, the Solon Geese of older authors, each as large as a goose, pure white with black wing tips and a slight creamy wash on crown and hind neck. The air is filled with their waving wings. They fill it like a swarm of giant midges circling in the sun.

The rocks from which they came come down straight into the sea with white surf breaking at their feet. Here and there in calmer moments good boatsmanship and agility effects a landing on some of the shelving bottom ledges from which a sure foot and steady head gives access to some of the nesting ledges above. As the investigator jumps ashore more of the birds leave the ledges over head, stopping but momentarily to relieve themselves of the weight of the last meal, and a shower of partially digested fish that they disgorge falls all about with squashy flops making the moment interesting and not a little apprehensive to the intruder until the worst of the shower ceases.

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Photographs by the author, through the courtesy of the Geological Survey.

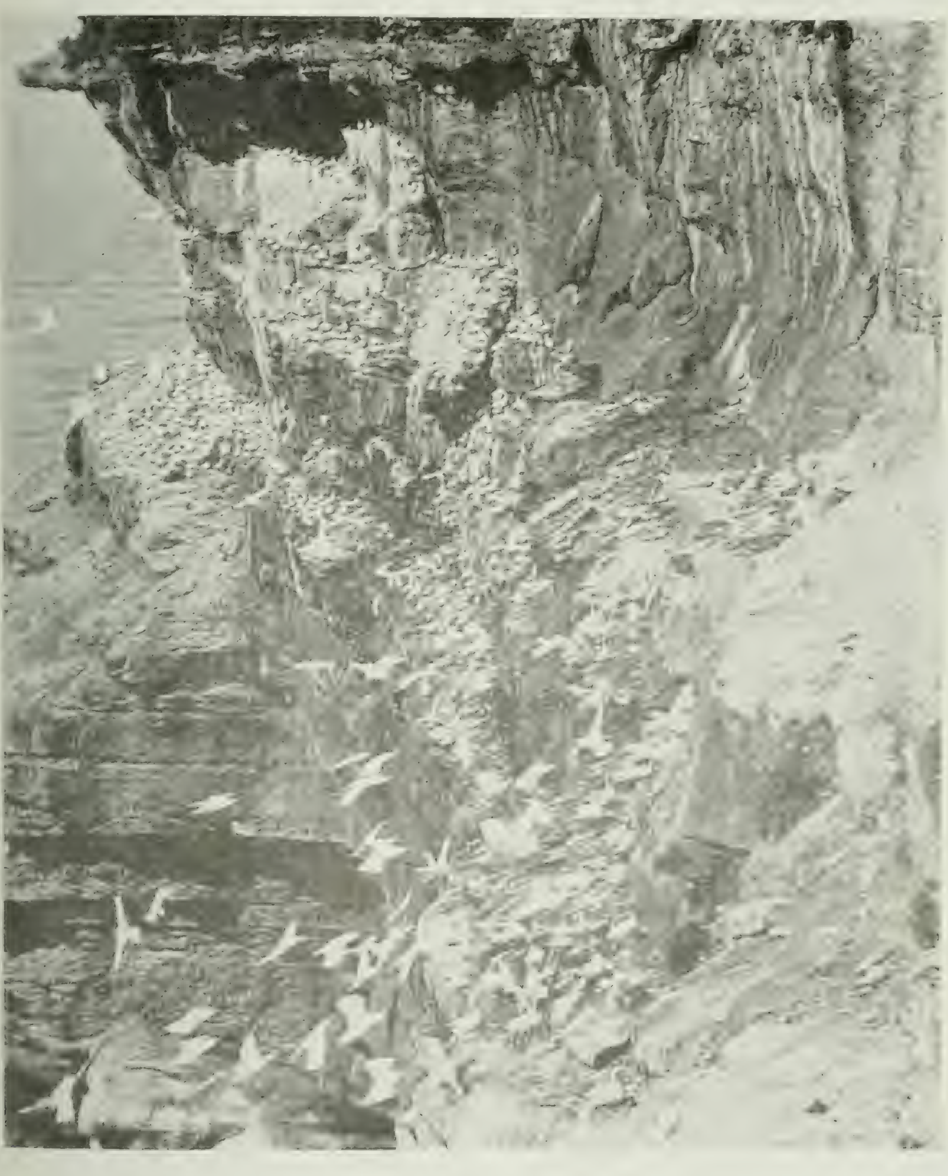
The rock is a coarse conglomerate of innumerable pebbles of all sizes in a matrix of brick red sandstone. The binding material has weathered away leaving the stones protuberant and more or less loose. While this roughness gives good foot hold there is the constant and well founded fear of their loosening under the tread and precipitating the explorer a hundred feet or more into the sea or on the jagged rocks below. Good hob-nails, stocking feet or thin rubber soles are absolutely necessary on such ground and are sources of considerable satisfaction when by dint of strenuous climbing one arrives at an upper ledge and greater height increases apprehension.

Many of the ledges wind along the face of the cliff for considerable distances narrowing here to mere toe holds with steeply rounded edges, widening there to shelves several feet across blocked occasionally by fallen boulders from above or rendered still more treacherous by the slippery wet oozings seeping down from upper levels. Everywhere is the dazzling wash of white guano, and the strong acrid smell mingled with that of decayed fish liberally scattered about and steaming in the hot sun makes even hardened enthusiasts catch the breath. The great white birds fill the air fanning the cheek as they pass by at one side of a great circle, the other segment lying far out over the water. On the ledge ahead are many more, some brooding young or eggs, on their nests of matted seaweed, others sitting gravely watching the intruder. When approached too closely they lumber awkwardly down from the nest, scramble to the inclined edge and throw themselves over to catch the air on their broad pinions and join the protesting ever passing throng.

Though the Gannets are the most conspicuous form of bird life on the ledges they are not the only one. Here and there are long horizontal cracks extending ten or fifteen feet back into the heart of the rock. The floors of these are covered well with red mud, mixed with guano puddled and padded by the feet of Murres, Razor-billed Auks and Puffins whose eggs can be seen scattered here and there on the bare floor. When approached hundreds of these birds rush out from the bowels of the earth towards the light, hurl themselves into the air regardless of obstructions, and so off to sea. Caution must be used in investigating such places, and the story is current and easily to be believed, that one uncautious intruder had both eyes pierced by the sharp bills of the escaping birds. When the first rush is over one can look back into the depths of the creases and, lined against the wall at the back, see rows of young or lingering Murres lined up like soldiers on parade their white breasts gleaming in the shadows. The Murres show little inclination to return when disturbed by uninvited humans, the Puffins, however, keep going and coming continually along the ledges just beyond the danger zone. An interesting fact seems to be that though these birds are not particularly wild on the breeding ledges they seem to have absolutely no fear of danger coming at them from the depths of the cliff itself. One can crawl into one of these deep cracks and squeeze along on the stomach, if the stomach permits and revolts not; and so worming along can come to the mouth where the Puffins are disporting themselves on the outer ledge. They look inquisitively at the queer invaders of their stronghold but seemingly fail to connect him with danger and can be watched at nearly arm's length for hours at a time. With their great gaudy coloured bills, small staring eyes and funny waddling little motions they are indescribably quaint while the absolute gravity of their manner and unconsciousness of their comedy makes the humour of their bearing almost irresistible.

Out on the ledges during this retirement many of the Gannets return. On reappearing a few of the nearest reluctantly lumber off and their single egg, or the black-faced, white down-wrapped young can be examined at leisure. The nests are conical piles of weed some six to ten inches high when new, merged into the surrounding ground with guano. The saucer-shaped depression on the top contains the single egg stained red with the mud from the rock, like all other eggs on these red cliffs. Older nests containing young have been tramped flatter and flatter by the growing young and the parent bird that seems to cease the constant construction, adjusting and repairing indulged in previously as soon as the young are hatched. Finally, when the young are ready to leave, the nests are mere flat mounds with little form or shape.

In rougher weather the ledges can only be reached from the top of the cliffs but the approach from thence is as interesting in its way as from below. Landing on the shoreward side at the village of Bonaventure one proceeds along the grass grown road between quaint fisher-folk houses and garden patches through fields bright with daisies, meadows purple with iris and dotted with cattle, trimmed balsam and spruce groves between which cow pads wind like paths in a Japanese garden. We climb steeper hills, skirt rock shoulders, finally plunge into the heavier evergreen woods and follow along the wooded cliff verge, the sea showing between the tangle and tree trunks at the right and the dark, mossy woods, damp with sea mists, mounting the rise on the left. At one place the Herring Gulls, protesting at the intrusion so near their nesting ledges, perch on the tree tops and hoarsely scream as we pass. Finally, the last declivity is surmounted and open meadow at the head of the Gannet rookeries is reached.



General view of cliffs; birds leaving ledges.

At first nothing is seen but the green sward kept to an emerald hue by the damp gulf air and the sharp line where it drops off against the blue sea or sky. A low murmur of hoarse cries rises up from innumerable throats hidden over the crest and an occasional breeze wafts a whiff of acrid guano odour from below. Going out on a small projecting point, a spot is found where a long line of cliff face can be enfilated and a wonderful sight greets the eye. Looking down on the upper surfaces, tiers of irregular white shelving are seen, peopled with hundreds of birds, the din of raucous voices increase and hundreds of great white gannets launch out into the air. They circle out over the sea and return to leeward, sailing by and passing the cliff edge at almost arm's length against the wind. They pause as they reach a strong salient point of the cliff beyond and meet the full strength of the breeze, pause a moment, and then fall off seawards to circle a quarter of a mile out and return and repeat indefinitely. As each bird passes it turns its ivory bill and blue circled silvery eyes full upon the intruder, follows him with calm impersonal stare until well past and then straightens away on its course to be replaced in a moment by the next one that repeats the motions to a nicety. Bird follows bird so fast that they cannot be counted. Each the exact duplicate of the last until one is finally almost forced to turn the eyes away from the confusing repetition to prevent dizziness in a situation where dizziness may be fatal.

There is nearly half a mile of these cliffs peopled by Gannets, ending at the far point in Great Gannet Ledge where the most spectacular view is obtained. Every here and there are small salients where one can closely approach the edge and, reclining on the grassy margin, view the scene at ease. After a few minutes the birds begin to return to their stations and with them one sees Murres, Puffins and Razor-billed Auks hurrying to and from their nesting crevices throughout the height of the cliff. The Puffins with their quick bee-like buzz of wings, and the Murres and Auks with rather slower wing-beat fly with the business-like directness of aerial torpedoes. The Gannets crowd the ledges until it seems that there is no room for more, but still they come. Occasionally one skirts a shelf a considerable distance before finding unoccupied foothold then it forces its way between adjoining birds sometimes knocking several off with its broad wings as it alights. One holds his breath almost expecting to see these so unceremoniously treated dashed on the rocks three hundred feet below, but no, before descent begins the ample wings open and the victim glides off in safety, calling back protesting grunts as it joins the circling flock. The new arrival looks around, eyes its nest further back on the ledge and measures the crowd between, then with an awkward waddle, makes straight for its objective amid a shower of blows of bill and wing from disturbed neighbours en route. Arriving at its own nest site it exchanges challenges with all surrounding it. At first threatening these interchanges become more formal and end at last with a sort of conventionalized ritual in which the head of opposing birds is thrown straight up in the air and the bill opened and closed, then the head is held at right angles to the neck and pumped up and down several times as if bowing. This is repeated several times, becoming more and more prefunctionary until it dies away. But even after all are at rest this series of conventional courtesies is exchanged occasionally between sitting birds. When a bird desires to leave the nest formality is dispensed with. Though it may be well at the back of the ledge and separated from the verge by numbers of other birds it suddenly makes straight for the edge, wabbling, flopping and and sliding irrespective of who or what is in the way. By a sudden dash it takes all by surprise and almost before a bill can be brought against it or a blow driven home it is over the edge and away leaving a wake of upset and protesting birds who momentarily turn their weapons against each other and then philosophically resume their places and comparative quiet reigns again.

A steady head can reach some of the occupied ledges nearer the top unaided, but a rope and stout helping hand at the top are of great assistance and insure confidence. There one can scramble about amongst the sitting birds. They are not very wild on the less accessible ledges and when they have young can even be caught in the hand, but their bills are powerful, finely saw-edged and can make a nasty wound, and it is better to take the obvious fact for granted than to demonstrate it. The young when first hatched are shapeless, moist, gray, slug-like creatures that can barely raise their heads unsteadily from the ground and then let them fall again with helpless weakness. Later a white down comes out over all the body except the face, which has a black shivelled appearance, like that of an old, old negro with features surrounded with white wool. They are extremely quaint as they stand or sit up with the gravity of judges. The adult as mentioned before is pure white with black wing tips and a golden creamy wash over crown and nape. The bird of the year when able to shift for itself is smoky brown covered over all with fine white V-shaped spots. In between this latter plumage and the adult is every intermediate stage of pied spotting. Contrary to what would naturaly be expected such birds are comparatively scarce in the neighbourhood of the rookery perhaps averaging in the total population less than one in fifty. The only explanation that can at present be advanced is that the majority of the juveniles remain out at sea until maturity and only the breeding adults come in to them in the nesting season, accompanied by a few juveniles that can be regarded more or less as accidentals.

Many pages could be covered with the results of the study of these birds on their nesting ledges. It is to be noticed that through the day all birds have the bill closed, while flash-lights at night show them with mouths wide open. A night visit to the cliff well repays the trouble. The continual chorus of harsh voices is subdued and there is little movement on the ledges. However, there always seems to be a few uneasy spirits abroad even at night. Occasionally one returns and, in the darkness against the glow of the sea, glides across the view like a pale ghost. Where it alights, off in the darkness, there is an awakened chorus of voices and then silence comes again. From the sea in front come soft questioning *mu-u-u-r-r-'s* of the Murres taking their young off to sea before they are fledged, for none linger in the neighbourhood of the rocks once they take to the water. A sweetish pungency, different from the sharp reek of the ledges, wafts hauntingly by. It is strongest in the vicinity of certain cracks in the ground and the clefts under large stones scattered about the level. Weird voices are heard in the air and soft black shapes sweep by. They are Leach's Petrels, and the not unpleasant odor proceeds from them. They nest in cavities in the ground where they spend the day and are only seen over land at night. Then they sweep around beating up and down the aisles of the spruce clumps or over the grassy meadows and the night is filled with them and their little low, weird song.

Such is the great bird colony of Bonaventure Island. During our visits in 1914 and 1915, we estimated that there were in the neighbourhood of about eight thousand birds there. Economically they are of no importance either way. No one thinks of eating them, and they probably would be less than indifferent for this purpose. Their food is fish, mostly herring, though other fish of similar size and squid are taken. Their effect on the fisheries is nil. When herring are caught by the boat load expressly for fertilizer, or their eggs are shovelled up from windrows on the beach for the same purpose, the inroads these birds can make in the

A Family Groupe.

countless numbers is unappreciable. They are magnificent birds and their presence adds considerably to the interest of all the coast whilst the presence here of this great rookery makes a sight that should prove a constant asset in attracting visitors to the neighbourhood. The Gannets are looked upon by most of the local fishermen with favour. To the fish-wise ones their actions indicate when the squid and herring, much sought for for bait, come and where they are and about how deep they lie. In foggy weather the cries of the birds act as a natural fog horn warning mariners away from the dangerous rocks of the rookeries and many a shipwreck has been avoided by the hearing of their timely warnings. Yet in spite of the uselessness of the dead birds, their obvious beauty, and some slight practical usefulness, I regret to say that they are shamefully persecuted. I have seen a boat containing eight to ten guns with unlimited ammunition, repair to the ledges for a day's sport (?) The results were seen later when the rocky base was littered with dead and wounded birds and their sodden remains washed back and forth in the adjoining sea. At one point on the mainland beach some five miles from the scene of the slaughter, within a hundred yards a dozen or more birds were to be seen where they had been stranded by the tide, but the saddest sight of all, was up on one of the lower ledges where pot-shots had been taken of the crowded sitting birds. Here for some distance lay a trail of dead birds still on the nests where they had been shot with the young pinned beneath the cold bodies of their parents. Other young stood disconsolately about until a humane heel or blow of a gunstock put an end to their hunger and cold. Below on rocks just above the swirl of the sea where they had managed to clamber were numerous wounded adults patiently awaiting death that lingered in its coming.

There is a movement under way by the Conservation Commission to reserve this wonderful spot as a perpetual bird reserve under the control of Dominion or Provincial authorities, but such is the conservativeness, to call it by its mildest name, of the local population that considerable objections have had to be overcome and it is still doubtful after three years of effort, whether the plan will succeed or not. Some day the local population will realize that these rookeries are a source of attraction to strangers and too valuable a local asset to be wantonly destroyed. Until some such light breaks upon the community, and awakens public opinion and a spirit of protection, the senseless destruction will proceed. It is to be hoped either that the protective measures will be completed or this awakening will come before it is too late.

NOTES.

It is reported[*] that the fields over which the battle of the Somme raged during the late summer and autumn of 1916 were thickly carpeted with blooming plants less than a year later. July of 1917 saw vast stretches of scarlet poppies, interspersed with acres of chamomile *(Matricaria chamomilla,* L.) and large patches of yellow charlock, glorifying what had been but a dreary waste of mud and water throughout the preceding winter. Half-hidden within this luxuriant growth white crosses mark the graves of the dead. Where shells left yawning holes, water has gathered and formed ponds, which are rendered more or less permanent by the nature of the soil. In and around these flourish the annual rush *(Juncus bufonius),* the smartweed *(Polygonum persicaria),* and numerous water grasses. Dragon flies hover about the pools, which teem with water beetles and various other forms of pond life. The woods which once covered the uplands have been destroyed almost entirely by the heavy shelling. Only at Aveluy Wood a few badly broken trees still live, and these rise from a dense growth of rosebay willow-herb *(Epilobium angustifolium).* The extraordinary method of cultivation of the soil apparently has increased its productive power. The underlying chalk formation has been broken up, mixing with the subsoil and the old surface soil, thus forming a new and very fertile combination, from which the various seeds, many of them perhaps long buried deep in the ground, have sprung with great vigor. Patches of oats and barley and occasionally of wheat are to be seen. These may have been sown by the Germans, or they may have lain dormant in the ground since before the war when this land was all under cultivation. Along the roadsides are traces of the old permanent flora; while here and there remains of currant and other bushes show where a cottage stood with its garden.—*The American Museum Journal,* May, 1918.

A Check List of North American Amphibians and Reptiles, by Leonard Stejneger and Thomas Barbour, issued by the Harvard University Press, is a work for which there existed an urgent need. The list has been prepared generally upon the lines of the American Ornithologists Union Check List of Birds. As Dr. Stejneger and Dr. Barbour are the foremost herpetologists in North America, students of the subject will have the greatest confidence in the book.

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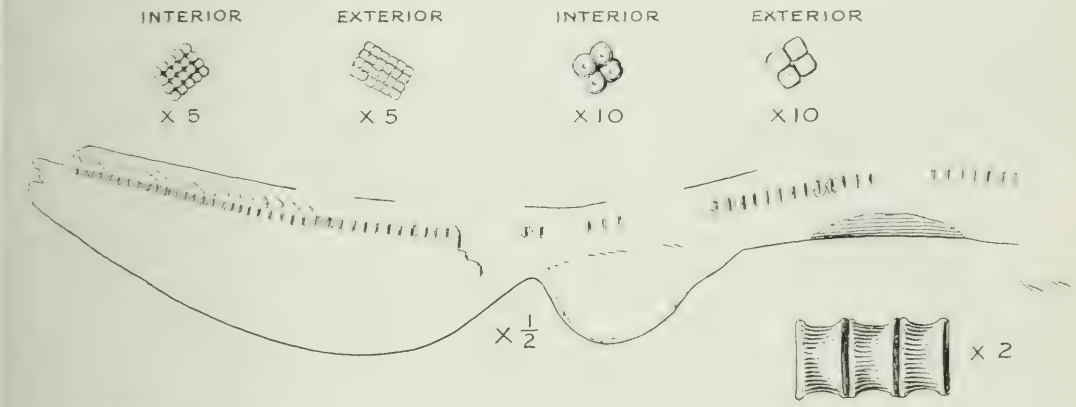
[*] Capt. A. W. Hill, Assistant Director Royal Botanic Gardens, Kew, England, in the Kew Bulletin of Miscellaneous Information, Nos. 9 and 10, 1917.

ON THE REMAINS OF A SELACHIAN FROM THE EDMONTON CRETACEOUS OF ALBERTA.*

BY LAWRENCE M. LAMBE, F.R.S.C., VERTEBRATE PALÆONTOLOGIST,
GEOLOGICAL SURVEY OF CANADA.

The subject of the following remarks consists of the caudal and hinder abdominal regions of a selachian tentatively referred to the genus *Palaeospinax* of the family *Cestraciontidae.*

The specimen (field No. 5) is included in the Geological Survey collection of 1915 from the Edmonton formation on Red Deer river, Alberta, and was obtained on the east side of the river, three miles north of Tolman, at about 350 feet above the river level. Its discovery was made by Mr. George F. Sternberg in charge of the Vertebrate Palæontological field party working in the beds of the above formation during the season of 1915.



Central figure.—Outline of type of Palaeospinax ejuncidus from the Edmonton formation of Alberta. One-half natural size.
Upper figures.—Shagreen granules; interior and exterior surfaces. Five and ten times natural size.
Lower figure.—Restoration of three vertebrae from front half of specimen to shew general proportions only. Twice natural size.

These remains of a small shark occur on the weathered surface of a thick layer of hard grey sandstone. About half the length of a slender fish is represented, from the neighbourhood of the pelvic fins to near the end of the tail, the tip not being preserved. About 80 vertebræ had been present, following each other in natural sequence in a lengthened sigmoid curve, 245 mm. long, but only 30 of them now partially remain; many of the remainder are represented merely by their impressions, and of some no trace is left. The vertebræ extended throughout the length of the specimen. See text figures.

The outline is well preserved below, especially along the lobe of the tail where it is clear and sharp. It continues forward to near the anterior end of the specimen where it is lost. Above it is clearly indicated at intervals in the caudal region and for some distance in advance of it, but is not seen farther forward.

The tail occupied about one-half the length of the specimen and was preceded closely by the anal fin of which the outline is clearly shown. At the extreme anterior end of the specimen inferiorly there are obscure indications of the pelvic fins and certain fragments that may be the remains of claspers, but they are too indefinite to allow of a satisfactory conclusion being reached as to their nature.

The body and fins were enveloped in shagreen of which the granules were minute. The shagreen is preserved throughout the tail except in its upper front portion. In advance of the tail its continuity is broken, but it is principally seen along the line of the vertebral column, and dorsally and ventrally defining the outline.

The specimen lies with its left side in the rock and it is the inner surface of the shagreen for the most part which is exposed to view, and on which the remains of vertebræ or vertebral impressions are left.

The vertebræ were apparently cyclospondylic in character. They were higher than long, cupped at either end, and constricted at the middle. The parts that have resisted erosion consist principally of the left rim of the ends; in no case is there anything remaining of the constricted middle portion, so that what is present is made up of a series of partial ends in couples, each pair being contributed to by an anterior vertebral end and a posterior end of the vertebra next in front. Where the vertebræ have been fully removed their impressions are left in the shagreen, or where erosion has been most severe the shagreen itself has disappeared.

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Toward the anterior end of the series the vertebræ are about 5 mm. high, and 3.5 mm. long, with ten in a space of about 35 mm. There is a gradual diminution in size posteriorly in the series, until, in the hinder half of the tail, there are thirteen vertebral bodies in an equal space.

The granular shagreen tubercles are minute, of one size, nearly square with rounded angles, and fit closely together, four occurring in a space of 1 mm. As seen from within they are decidedly convex or tumid, and have the appearance of being nearly circular in outline. Each tubercle has, in this aspect, a central, circular opening or depression. In what appears to be an external view they are somewhat more regularly four-sided, convex, and apparently devoid of sculpture.

The anal fin is subtriangular in lateral aspect, nearly twice as long as deep, and broadly rounded below. In it the shagreen is preserved mainly along the basal line, and the free edges. The caudal lobe is long, with a maximum depth about equal to that of the anal fin. Its length is over five times its depth, and throughout the shagreen is present, sharply defining the sweeping curve of the lower margin. Above the base of the caudal lobe the shagreen in the specimen, passes up behind the spinal column and ends dorsally in a definite longitudinal line a short distance (about 6 mm. at the midlength of the tail) above the vertebræ. In the shagreen surface above the posterior caudal vertebræ obscure parallel markings, directed obliquely upward and backward, may indicate the presence of fin-supports, apparently one to each vertebra. Superiorly, above the anal fin, an indefiniteness in the dorsal outline suggests the possible position of a dorsal fin which might be expected in this neighbourhood. From slightly in advance of here to the forward end of the specimen the dorsal outline is not preserved.

This specimen has much the same size and proportions as *Palaeospinax priscus* (Agassiz) as described and figured by Smith Woodward from the Lower Lias of Dorset.* It differs from that species in having the anal fin close to the caudal, in the vertebræ being smaller, and the granules of the shagreen of one size only. For the very slender species represented the name *ejuncidus* is proposed.

In view of the fact that this interesting specimen supplies no information regarding the dorsal fins, and therefore as to whether they have spines or not, the assignment of the species to the genus *Palaeospinax* is a provisional measure only until we have further knowledge of its structure.

UNUSUAL NESTING MATERIAL USED BY PURPLE MARTINS.

The birds, like human beings, have in their midst eccentric individuals that deviate from the path of custom to do the unusual. In some cases no doubt these unusual acts, induced by various causes, gradually become more usual and eventually customary. For instance, man-made sites, from being the unusual, have become the usual nesting places of the Purple Martins; and furthermore it appears that these birds are about to take another step in their evolution by adopting man-made nesting material. As evidence I submit the following list of material taken from one compartment of my martin house:

36 bits of window glass.
33 flat bits of rock.
9 pieces of clam shell.
4 scraps of tin roofing.
6 nails—1 to 4 inches.
1 slate pencil.
1 bit of dry orange peel.
1 safety pin.
1 pint of the usual twigs, dead grass and green leaves—elm in this case.

Probably one or both builders of this unusual nest had been hatched or had formerly nested in some congested city where the usual nesting material was not procurable, only such as listed above being available, and in spite of the fact that grass, twigs and green leaves were plentiful in my neighbourhood, this inherited or acquired conception of nest building had persisted.

The male bird of this 20th century couple, which built a home of stone and glass and furnished it with a safety pin and a slate pencil (evidently intended sending their "little troubles" to school), had not attained the age of purple plumage, still being light breasted.

CLYDE L. PATCH.

Ottawa.

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*Cat. Fossil Fishes Brit. Mus. pt. 1, 1889, p. 328, pl. VII, fig. 1.

THE ECONOMIC VALUE OF BATRACHIANS AND REPTILES.*

By Clyde L. Patch.

The Batrachians in Canada comprise the Toads, the Frogs and the Salamanders; the Reptiles, the Turtles, the Lizards and the Snakes. These two groups of animals, which include all cold-blooded vertebrates other than fishes, differ in many important respects.

The Batrachians lay their eggs in the water, where they hatch; and the young, which differ greatly from the adults in form, breathe by means of gills very much as do fishes. Most species undergo a metamorphosis during which the gills disappear and the tadpole assumes the form and structure of its parents and leaves the water to breathe air and spend a greater or lesser portion of its life on land. The skin of batrachians is not provided with scales, but may be either smooth or warty and often contain glands that secrete a sticky fluid which, although somewhat acrid, is harmless.

The Reptiles never lay their eggs in the water—even the marine turtles come on land for this purpose. Their young do not breathe by means of gills, but are hatched or born (some species give birth to young) with the form and structure of the adult. The skin, except of some turtles, is covered with scales.

Photograph by Clyde L. Patch.

An ally of the gardener, the American Toad.

The first vertebrate animals that could live upon land were the primitive, frog-like batrachians, which first ventured out of the water millions of years ago, in the middle of the Palæozoic or second great period of the earth's history. Though it is believed that the reptiles, birds and mammals are derived from these slow-crawling, cold-blooded batrachians, the fossil remains found in the rocks of the various geologic ages do not form a complete record of the successive stages of the descent.

Many million years ago, in the middle of the Mesozoic Era, which was the third great period of the earth's history, the reptiles were the rulers of the earth as the mammals are to-day. Huge monsters, more than one hundred feet in length and most grotesquely fashioned, roamed over the land, while equally weird reptiles inhabited the seas, and in the air were creatures whose wings measured twenty feet from tip to tip. There were also smaller reptiles, including Crocodiles and Turtles not so very different from their modern descendants.

Birds are in many respects very similar to reptiles in structure and the two are thought to be closely related in their origin.

It was not until long after the huge reptilian monsters had become extinct that the first ape-like human beings appeared, therefore the statements of fiction writers who portray men of the Stone Age battling with dinosaurs are to be considered merely as fiction and not as facts. Also, the theory that our fear of reptiles is inherited from our arboreal ancestors seems rather far fetched. Personal observation has led the writer to believe that this dread is acquired in childhood when our elders tell us untrue things about the batrachians and reptiles, and teach us to avoid them. With the exception of Rattlesnakes, which so far as records show are confined to the central southern plains and to a few localities in southern Ontario, the batrachians and reptiles of Canada are quite harmless and are as beautiful and interesting as birds, flowers and insects—probably more interesting, as there are yet many unrecorded facts regarding their life histories.

During past ages these creatures have mistakenly been credited with many mysterious powers. Shakespeare calls the toad "ugly and venomous" and informs us that it "wears a precious jewel in his head." The salamander according to fable retained life when cast into fire and was able to extinguish the fire by the chill of its body. Pliny tells us that he made the experiment once, but the creature was burnt to a powder. Our Iroquois Indians believe that lizards bring on paralysis, while the Green Snake, if allowed to coil about a paralyzed part of the body, will cure it. Many misinformed people believe that toads make warts, that snakes charm birds and squirrels, that "Hoop Snakes" take their tails in their mouths and roll after their victims and that the Milk Snake milks cows, as it is often seen about barns and farm yards, to which it is not attracted by the cows but by the rats and mice which infest such places. Prof. Cope once observed a snake of this species which had captured a family of field mice; one of these it had swallowed, another was being swallowed, and the remaining two were so tightly held in two turns of the snake's body that they were incapable of biting their captor. A meadow mouse is estimated to do damage to the extent of fifty cents a year in field and orchard, therefore this snake at one meal virtually put two dollars in a farmer's pocket, but owing to ignorance combined with prejudice the average farmer in return would have crushed the useful creature's head with a rock had he seen it half an hour before.

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A snake is a better rat destroyer than a cat or a dozen traps as it can enter cracks and holes and destroy entire families of rodents. The Fox Snake, which feeds chiefly on rats and mice, is often found about farm buildings and in some localities is called "house snake" or "rat snake". The Corn Snake is so called because it frequents corn fields in search of mice.

Many of Canada's seventy-five or more species of batrachians and reptiles enhance their value by preying on stink bugs and ants—insects which are not much subject to the attacks of birds. The salamanders inhabit rotting logs which act as incubators and brooders for the noxious grubs on which they feed. The frogs, which are found in the trees, meadows and ponds, destroy vast numbers of flying, crawling and swimming insects, which if allowed to exist would do thousands of dollars' worth of damage to farm products. The turtles and lizards also feed chiefly on insects, and just as the horned lizards of the arid southwest are of tremendous importance to agriculture, so the common toads are of greater value in the better watered regions. It is estimated that in three months a common toad will eat 9,936 injurious insects, and that of this number 1,988 are cutworms. Placing a bounty of one cent each on cutworms, the potential value of a single toad is at least $19.88 per year. If additional toads were introduced into every garden and boards placed in shady corners under which they might hide during the day, the gardener's loss due to insects would be greatly reduced. Toads should also be placed in greenhouses and propagating frames.

According to the United States Department of Agriculture, the yearly food loss in the United States from the ravages of insects exceeds one billion dollars, and from house rats and mice (not including wild rodents) the loss amounts of $400,000,000; and without doubt proportionate losses occur in Canada. Protection should therefore be given to toads, frogs, salamanders, turtles, lizards and snakes, some of which destroy rodents and all of which prey on such pests as potato, squash and cucumber beetles and bugs; click beetles, parents of the wireworms; slugs and plant-lice, that live on the lettuce; Tussock, tent and armyworm caterpillars; sowbugs, that destroy plant roots; crickets, grasshoppers, locusts, grubs, worms, mosquitoes, flies, ants and moths.

NOTE ON INVERTEBRATES COLLECTED BY THE SOUTHERN PARTY OF THE CANADIAN ARCTIC EXPEDITION.

The Marine and Freshwater Invertebrates, collected by the Southern Party of the Canadian Arctic Expedition during 1913-16, at various points on the northwest and north coast of the continent from Port Clarence, Alaska, to Bathurst Inlet, N.W.T., have been sorted out and distributed to about fifty different specialists in Canada and the United States to report upon. The following is a short summary covering the six groups which have thus far been worked over.

The Freshwater Worms (Oligochæta) comprise about 10 species, of which two are new and all are recorded for the first time from the American Arctic.

The Echinoderms, Isopod and Decapod Crustacea include no new species, but the known ranges of distribution of the various forms have been greatly extended and gaps filled in.

The Parasitic Copepods (Crustacea) comprise five different species found on fishes and marine annelids.

The Molluscs represent 115 species, of which six marine and one freshwater are new to science. Those taken east of the Mackenzie delta are particularly valuable, being the first specimens collected in that region.

FRITS JOHANSEN.

REVISION OF SOME PHACOPID GENERA.*

BY F. H. MCLEARN, GEOLOGICAL SURVEY, OTTAWA.

INTRODUCTION.

In the preparation of a monograph on the fauna of the Silurian Arisaig series, it has been found necessary to revise the interpretation of several Phacopid genera; for the definitions now used are not considered to be in accord with the evolution of this trilobite family. *Dalmanitina* Reed, *Phacopidella* Reed and *Phacops* Emmrich are redefined. The equivalent of *Acaste* Goldfuss and *Acaste* Salter is pointed out. *Portlockia* McCoy is revived and emended, with subgeneric rank, for the Silurian ancestors of Devonian *Phacops, s. str.* The generic name *Glockeria* Wedekind is found to be untenable. *Phacopina* Clarke is not considered to be a true Phacopinid and is placed in the subfamily Dalmanitinæ.

In order that the proposed definitions of the above genera may be established on a genetic basis, the evolution of that portion of the family Phacopidæ concerned is treated first.

EVOLUTION.

Both Hoernes (1880) and Reed (1905) recognize in such Ordovician forms as *Dalmania socialis* Barrande a generalized and primitive expression of this family. The cephalon is characterized by well-marked pentamerism, all the glabella furrows being fully developed. The glabella is relatively high and narrow, with the lateral borders subparallel, or at most only slightly diverging. The genal angles are rounded off or produced merely into short spines. The pygidium has few segments and is rounded on the posterior border. This generalized stock continues into the Silurian. It is represented there by forms like *Phacops (Acaste) constricta* Salter and *Calymene downingiae* Murchison which show no important modification of either the cephalon or pygidium except rarely the slight mucronation of the latter. Closely associated with the parent line are a number of forms slightly modified in the direction of the Phacopinæ by obsolescence of the two anterior pairs of glabella furrows. But the glabella is still high, its borders are not conspicuously divergent and the third pair of side lobes are not greatly reduced. They cannot be regarded as Phacopinid. This slight modification reoccurs in the Ordovician, Silurian and Devonian. In the Ordovician this departure from the primitive type is exhibited by *Dalmania phillipsi* Barrande and *D. solitaria* Barrande. The only important modification here is the obsolescence of the two anterior furrows. In the Silurian a similar modification is shown in the Arisaig *Dalmania logani* Hall, but since it exhibits all gradations with a primitive form *D. logani* var. *conservatrix*, n. var., it is thought to be independent of the Ordovician forms and not derived out of them. A Devonian departure from the primitive stock of the same nature is to be found in such species as *Phacops braziliensis* Clarke and *P. anceps* Clarke, which Clarke has incorporated into his genus *Phacopina*. The change here is not much more than in *D. logani* or the similar Ordovician species and cannot be compared with the profound modification of the Phacopinæ.

Several Ordovician species show a slight modification of the normal *Dalmanitina* type by a broadening anteriorly of the glabella, but retaining the primitive pentamerism. The third pair of glabella lobes, although small, are not markedly reduced and are tuberculose at the extremities as in the Phacopinæ. Such forms are *Phacops (Acaste) alifrons* Salter (1864, p. 33) and *Phacops jamesii* Portlock (Salter 1864, p. 32). Another modification of the generalized line in the Ordovician is exhibited by the species *Phacops brongniarti* Portlock (Salter 1864, p. 34) which while retaining the primitive pentamerism of the glabella shows a considerable broadening anteriorly of the latter and a very considerable reduction of the third pair of side lobes with tuberculation of their extremities. In the last character this is a very near approach to the Phacopinæ. This subfamily, however, does not appear until the early Silurian.

In very late Ordovician or earliest Silurian time the generalized line of the Phacopidæ gave rise to two quite far removed groups, both of which are very distinct from the coeval primitive stock. On the one hand, as Reed has noted (1905, pp. 176, 224), arose *Dalmanites* Barrande and related genera, in which the frontal lobe becomes semi-detached from the remainder of the glabella by the broadening of the anterior pair of furrows, the genal angles become produced into spines, the pygidium has numerous segments, its axis becomes more slender and it is nearly always mucronate or produced in a spine. An intermediate form, *Dalmanites weaveri* (Salter) appears in the early Silurian (Upper Llandovery) in which the pygidium is not mucronate and the genal angles are not produced into spines. In the Devonian in particular this stock becomes highly differentiated in spinescence, modification of glabella, etc.

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*By permission of the Director of the Geological Survey, Canada.

The true Phacopinid characters appear in the Silurian. There takes place, as Reed (1905, p. 176) has shown, a partial loss of pentamerism, a shortening and broadening anteriorly of the glabella, so that it is no longer high with subparallel sides, but wide with markedly diverging lateral borders. The third pair of side glabella lobes become greatly reduced and are often nodular at the extremity. There is a general absence of spines, the genal angles being rounded off and the pygidium nonmucronate with few segments. In addition to the smaller eyed *Trimerocephalus* forms, these modifications take place in two distinct, though closely related, Silurian groups, the one characteristic of the Tethys (Bohemia) realm, and the other widely spread, but typical of the northern Atlantic realm. For the present, the former may be referred to as the group of *P. glockeri* Barrande and the latter as the group of *P. stokesii* (Milne-Edwards). In the *P. glockeri* group the anterior glabella furrows are broadened and deepened in a characteristic manner, so that the frontal lobe is almost detached as in *Dalmanites*. The segregation of this group was recognized by Wedekind (1911) who incorporated it under the name of his genus *Glockeria*. It will be shown, however, that this name cannot stand. In the other group, apparently not represented in the Tethys (Bohemia) realm the first and second pairs of glabella lobes are almost completely fused with the frontal lobe leaving only faint furrows, while the third pair is profoundly reduced and at its extremities becomes characteristically nodular. In the earlier Silurian this group includes *Phacops orestes* Billings, *Trilobites elegans* Sars and Boeck and *Phacops (Portlockia) marklandensis*, n. sp. In the later Silurian it embraces *Calymene stokesii* Milne-Edwards. While the group of *P. glockeri* becomes extinct at the end of the Silurian, the second group gives rise to numerous forms in the Devonian. But as already noted by Wedekind (1911) the Silurian forms are considerably unlike their descendants. They differ in their smaller size, poorer development of tuberculose surface, especially of the glabella, and much more depressed, never overhanging anterior surface of the glabella. The last character is very diagnostic and of stratigraphic value.

SYSTEMATIC RELATIONS.

Phylum ARTHROPODA.
Class CRUSTACEA.
Subclass TRILOBITA WALSH.
Order PROPARIA BEECHER.
Family PHACOPIDAE CORDA.
Subfamily DALMANITINAE REED.
Genus DALMANITINA REED.

1843. *Acaste* Goldfuss (non Leach) (partim), Neues Jahr. Min., etc., 1843, p. 563.
1845. *Dalmania* Emmrich (non Desvoidy) (partim), Neues Jahr. Min., etc., 1845, p. 40.
1852. *Dalmania* Barrande (partim), Syst. Sil. du Centre Boheme, 1, p. 528.
1852. *Dalmanites* Barrande (partim), Syst. Sil. du Centre Boheme, 1, p. 934.
1864. *Acaste* Salter, Mon. Brit. Tril., Pal. Soc., 1864, p. 14.
1905. *Dalmanitina* Reed, Geol. Mag., (5), 2, p. 224.
1905. *Phacopidella* Reed (partim), Geol. Mag., (5), 2, p. 173.
1906. *Phacopidella* Reed, Lower Pal. Tril. Girvan, III, Pal. Soc., p. 156.
1913. *Dalmanitina* Raymond, Zittel - Eastman Textb. Pal., 2nd ed., p. 726.
1913. *Phacopidella* Raymond (partim), Zittel-Eastman Textb. Pal., 2nd ed., fig. 1409.

The genus *Dalmanitina*, proposed by its author (as a subgenus of *Dalmanites* Barrande) for the primitive generalized Ordovician types, is now extended to include what are here interpreted as similar generalized forms in the Silurian. The generic characters are: well-marked pentamerism of the glabella without semi-detachment of the frontal lobe, genal angles rounded off or only produced into short spines, pygidium with few segments and rounded posteriorly or rarely produced in a short mucronation. It includes *Dalmania socialis* Barrande, *Calymene downingiae* Murchison, *Phacops (Acaste) constricta* Salter, and *Dalmanitina logani* var. *conservatrixe*, n. var. The Ordovician *P. apiculata* (Salter) apparently also belongs here.

As here interpreted *Dalmanitina* is considered to replace *Acaste* Goldfuss and in particular Salter's use of it. *Acaste* was erected by Goldfuss in 1843 for forms with the pentamerism of the glabella retained. It thus included forms now referred to *Dalmanitina*, but of course was given a broader interpretation than is now proposed for the latter genus. Salter's use of *Acaste* was more restricted and practically coincides with that of *Dalmanitina* as here emended. Under it he places all the Silurian forms listed above with the exception of the then unknown Arisaig variety. Salter gave *Acaste* only subgeneric rank, under the genus *Phacops*.

Reed includes the Silurian forms now referred to *Dalmanitina* in his broad subgenus *Phacopidella*, for he did not extend the scope of *Dalmanitina* beyond the Ordovician. He designated the *Acaste* forms as falling within it and in 1906 referred *Calymene downingiae* Murchison to the subgenus (of *Phacops*) *Phacopidella*.

Two independent and slight departures from the unmodified *Dalmanitina* line showing obsolesence of the anterior furrows are here provisionally retained within it. They embrace in the Ordovician forms like *D. phillipsi* Barrande and in the Silurian the species *D. logani* Hall.

Other slight departures from the primitive stock, exhibiting a considerable broadening anteriorly of the glabella, are retained under *Dalmanitina*. They include *Phacops (Acaste) alifrons* Salter and *P. jamesii* Portlock, both from the Ordovician. The Ordovician *Phacops brongniarti* Portlock is probably a more considerable modification of the normal *Dalmanitina*, but without actual study of specimens of this species, it would not be wise to determine its affinities in any detail. It is apparently the nearest approach to the Phacopinæ in the Ordovician in one character at least, reference to which has been made on a previous page.

In a more extended revision of the Phacopidæ it may be found wise to erect subgenera for these slightly modified *Dalmanitina*-like forms. A new subfamily might also be erected to include *Phacopina* Clarke, *Dalmanitina* Reed and the new subgenera. Such a subfamily would then embrace the entire primitive or little modified stock of the Phacopidæ.

Genotype: *Dalmania socialis* Barrande.

Dalmanitina logani var. *conservatrix*, n. var.

(*conservatrix*, preserver).

This variety only differs from *Dalmanitina logani* (Hall) by having all the glabella furrows well impressed but all gradations exist between them. Compared with *Dalmanitina downingiae* (Murchison) the frontal lobe is a little higher, the third side lobes slightly smaller, and the glabella surface variably tuberculose. The pygidium is mucronate and with a proportionately more slender and tapering axis. The cephalon is a little more than twice as wide as high. The maximum width is about 22 m.m. The average pygidium is 13 m.m. wide and 8 m.m. long.

Horizon and Locality. Rare in the Moydart and Stonehouse formations, Arisaig, N.S.

Collections. Victoria Memorial Museum, Yale University collections.

Genus Phacopina Clarke.

1890. *Phacops* Clarke, Archiv. do Mus. Nac. do Rio de Janeiro, 9, pp. 15-16, est. 1, figs. 1-3.
1905. *Phacopidella* Reed (partim), Geol. Mag., (5), 2, p. 226, footnote 1.
1913. *Phacopina Clarke*, Mon. Serv. Geol. E. Min. do Brasil, vol. 1, p. 151.

Dalmanitinids in which all but the third pair of lateral glabella lobes are fused together. They lack the broad expanding glabella with greatly reduced third pair of side lobes of the Phacopinæ. They also differ from the coeval Phacopinids by having a much more depressed and non-tuberculose glabella. It probably represents an early Devonian or late Silurian modification of the *Dalmanitina* stock. The genus is, therefore, placed in the subfamily Dalmanitinæ.

Genotype: *Phacops braziliensis* Clarke.

Genus Dalmanites Barrande.

1852. *Dalmanites* Barrande (partim), Syst. Sil. du Centre Boheme, 1, p. 934.
1904. *Dalmanites* Reed, Geol. Mag., (5), 2, p. 224.
1913. *Dalmanites* Raymond, Zittel - Eastman Textb. Pal., p. 726.

Genotype: *Trilobus caudatus* Brunnich.

Subfamily Phacopinæ Reed.

Genus Phacopidella Reed s. str.

1852. *Phacops* Barrande (partim.), Syst. Sil. du Centre Boheme, 1, pp. 525-528.
1905. *Phacopidella* Reed (partim), Geol. Mag., (5), 2, p. 173.
1911. *Glockeria* Wedekind, Zeitschr. Deutsch. Geol. Ges., vol. 63, p. 323.

Phacopidella Reed was erected in 1905 as a subgenus of *Phacops* Emmrich and was given a very broad interpretation. As already noted it was made to include the generalized Silurian forms which above have been placed under *Dalmanitina* Reed. Its author also included in it the Silurian group of *P. stokesii*, for he restricts *Phacops* Emmrich to the Devonian assigning all intermediate Silurian forms to *Phacopidella* and in 1906 refers *Trilobites elegans* Sars and Boeck to subgenus (of *Phacops*) *Phacopidella*. In addition he placed it in the Devonian group of *P. braziliensis* Clarke, which above has been shown not to be Phacopinid and for which Clarke created his genus *Phacopina* Clarke. The last and fourth group was that of *P. glockeri* Barrande. Since the genotype chosen by Reed (not *P. downingiae* as supposed by J. M. Clarke, 1913, p. 150) lies within this group, *Phacopidella* is now restricted to it. This confines it in time to the later Silurian and geographically to the Tethys (Bohemia) realm. In 1911 Wedekind proposed the generic name *Glockeria* for this group. *Phacopidella* having priority, Wedekind's name of course cannot stand.

Phacops glockeri Barrande, *P. trapeziceps* Barrande, and *P. bulliceps* Barrande are referred to the genus as restricted. The glabella of the last named species is not so broad and is more rounded anteriorly than in the other two species. They are all large-eyed Phacopinids with the characteristic modifications of the subfamily. The diagnostic feature that separates this group from the coeval Silurian *Phacops* forms is the retention of the first pair of glabella furrows which are of a characteristic form and give rise to a partly detached frontal lobe somewhat as in *Dalmanites.*

Genotype: *Phacops glockeri* Barrande.

Genus Phacops Emmrich s. str.

1819. *Somatrikelon* McMurtie, Sketches of Louisville and the falls of the Ohio; Louisville, 1819, pp. 74-75 (not sufficiently defined to be clearly recognizable).
1839. *Phacops* Emmrich (partim), De Trilob. Dissert., p. 18.
1843. *Phacops* Goldfuss (partim), Neues Jahr. Min., etc., 1843, p. 564.
1845. *Phacops* Emmrich (partim), Neues Jahr. Min., etc., 1845, p. 38.
1846. *Portlockia* McCoy (partim), Sil. Fossils Ireland, p. 50.
1852. *Phacops* Barrande (partim), Syst. Sil. du Centre Boheme, 1, p. 498.
1864. *Phacops* Salter (partim), Mon. Brit. Tril., Pal. Soc., p. 14.
1888. *Phacops* Hall, Pal. N.Y., 7, p. XXVII.
1905. *Phacops* (=*Somatrikelon*) Reed, Geol. Mag., (5), 2, pp. 226, 228.
1911. *Phacops* Wedekind (partim), Zeitsch. Deutsch. Geo.. Ges., vol. 63, p. 317.
1913. *Phacops* Raymond, Zittel-Eastman Textb. Pal., 2nd ed., p. 726.

As here restricted and based upon the genotype, the genus includes all of *Phacops* Wedekind with the exception of the Silurian group of *P. stokesii.* Although the author of *Phacops* did not choose a genotype for it, *P. latifrons* Bronn has been so designated by Barrande. He practically selected it in 1852 defining the usage of *Phacops* by referring to the type of *P. latifrons.*

The status of *Somatrikelon* McMurtie requires consideration, since, if established, as a synonym of *Phacops s. str.*, it would have priority. McMurtie (1819) described a new genus and species, *Somatrikelon megalomaton,* from a specimen found in "a block of limestone from the falls [of the Ohio]". In the diagnosis given, it is said to have a corrugated (segmented), tripartite, convex body, the axis arched, with a row of tubercles on either side, and the head subrotund with very large eyes. The "mouth" is said to be "formed like that of a snapping turtle". It may possibly have a tuberculose surface, for the statement is made that there is "not the smallest tubercle or wrinkle but what is preserved in its original form". The author, must be referring to something more than the tubercles at the extremities of the axial thoracic segments or he would not make use of the superlative. Only one specimen was known. The tripartite and corrugated (segmented) body suggests a trilobite. The large eyes point to either a *Proetus* or a *Phacops.* Both are present in the Devonian at the falls of the Ohio. The very large eyes and the possibly tuberculose surface suggests a *Phacops.* Three forms are found in the vicinity. *Phacops rana* Green occurs in the Jeffersonville limestone and Sellersburg beds (Onondaga and Hamilton).[*] *P. cristata* Hall is in the Jeffersonville limestone and just above the hydraulic beds of the Hamilton,[*] while its var. *pipa* Hall is found in the upper Onandaga.[*] They are all pronouncedly tuberculose, especially on the glabella. Indeed if we were certain of this character, *Somatrikelon megalomaton* McMurtie could be identified as a *Phacops* and as one of the three forms mentioned.

Vogdes (1893, p. 163) has listed McMurtie's species as a synonym of *Phacops rana* Green and Reed (1905, p. 226) suggests the possible use of *Somatrikelon*, but does not discard *Phacops* for it (1905, p. 228). The evidence certainly does not justify any decided conclusion. Therefore, since McMurtie's description although suggesting a *Phacops* is not at all conclusive, since only one specimen ever existed and that apparently is now lost, and as no one has adopted it although recognized by Vogdes, the writer prefers to regard it as having a doubtful status. As Vogdes observed long ago the generic name is very unsuitable anyway, applying as it does to the Trilobita as a whole.

Genotype: *Phacops latifrons* Bronn.

Subgenus Portlockia McCoy emend.

1839. *Phacops* Emmrich (partim), De Trilob. Dissert., p. 18.
1843. *Phacops* Goldfuss (partim), Neues Jahr. Min., etc., 1843, p. 564.
1845. *Phacops* Emmrich (partim), Neues Jahr. Min., etc., 1845, p. 38.
1846. *Portlockia* McCoy (Partim), Sil. Fossils Ireland, p. 50.
1852. *Phacops* Barrande (partim), Syst. Sil. du Centre Boheme, 1, p. 498.
1864. *Phacops* Salter (partim), Mon. Brit. Tril., Pal. Soc., p. 14.
1906. *Phacopidella* Reed (partim), The Lower Palæozoic Tril. Girvan, III, Pal. Soc., p. 154.
1911. *Phacops* Wedekind (partim), Zeitschr. Deutsch. Geol. Ges., vol 63, p. 317.

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[*] Personal communication, E. M. Kindle.

As already noted, the Silurian group of *Phacops stokesii* (Milne-Edwards) is ancestral to the group of *P. latifrons* Bronn and differs from the latter by having the glabella more depressed anteriorly, so as not to overhang the anterior margin, the size is smaller, and the surface less tuberculose. They are here placed under the subgenus *Portlockia* McCoy emend., with *P. stokesii* as the genotype. Among the species referred to it are:

Calymene stokesii Milne-Edwards.

Trilobites elegans Sars and Boeck.

Phacops orestes Billings.

Phacops (Portlockia) marklandensis, n. sp.

As described and applied by McCoy in 1846, *Portlockia* McCoy had a rather wide interpretation and included both Silurian and Devonian forms with the typical Phacopinid structure. It fell within *Phacops* Goldfuss and was practically equivalent to subgenus *Phacops* Salter, embracing both the *P. stokesii* and *P. latifrons* groups. McCoy (1846; 50) states that "this genus includes *Calymene tuberculata and C. macrothalma* of the Silurian system [=*Phacops latifrons* Bronn and *P. stokesii* Milne-Edwards according to synonomy of Salter (1864; 18, 21)]; *Phacops tuberculata* of Captain Portlock's Report; *Calymene nupera* Hall; *Calymene bufo* Green, etc." In 1846 he (1846, p. 51) described and placed in this genus *Portlockia sublaevis* McCoy. Salter considers this a synonym of *P. stokesii* (1864, pp. 21, 22). Later he (1855; 162) says: "The *Calymene bufo* of Green, *C. macrothalma* of Murchison [=*P. stokesii*], etc., being the types of the genus". Since *P. latifrons* is the type of *Phacops* Emmrich and *Calymene bufo* Green is a similar Devonian form, *Phacops* should be restricted to that group, while the group of *P. stokesii* is now separated under the subgenus *Portlockia*.

Genotype: *Calymene stokesii* Milne-Edwards.

Phacops (Portlockia) marklandensis, n. sp.

(*Markland*, Nova Scotia in Scandinavian mythology).

Compared with *Phacops (Portlockia) elegans* (Sars and Boeck) this species has a still more reduced basal (third side pair) lobe and smaller tubercules at its extremities. It differs in a similar manner from *P: (Portlockia) stokesii* Milne-Edwards and in addition in the presence of well developed, although not highly elevated, tubercules at the extremities of the thoracic axial segments. Compared with *P. (Portlockia) orestes* Billings, the basal lobe and tubercle are much more reduced, the thoracic-axial tubercles are more strongly developed and the axial segments relatively more slender. The glabella is somewhat depressed, with first pair of side furrows short, weakly impressed, and come anteriorly. The second pair are short, weakly impressed, and almost straight. The pygidium has four pairs of ribs on the pleural lobes, divided distally by a median sulcus. The fourth pair are faint. The axis of pygidium is divided into about eight rings.

Dorsal shield	width 14 m.m.,	length 20 m.m.
Cephalon	" 14 m.m.,	" 6 m.m.
Pygidium	" 9 m.m.,	" 5 m.m.

Horizon and Locality. Rare in the Ross Brook formation, Arisaig, N.S.

Collections. Victoria Memorial Museum, Yale University collections.

CONCLUSIONS.

The results of the foregoing discussion may now be summarized.

(1). A generalized primitive line ranging from the Ordovician into and through the Silurian is recognized. The genus *Dalmanitina* Reed is extended to include all of these unmodified forms. Thus interpreted it is considered to be practically synonymous with Salter's use of *Acaste* Goldfuss (non Leach) and in a broad way with *Acaste* as used by Goldfuss.

(2). A constant tendency to partial fusion of the two anterior lobes and the frontal lobe, but without the profound modification of the subfamily Phacopinæ Reed, is observed. Such Devonian forms are recognized in the species for which J. M. Clarke has proposed the generic name of *Phacopina*. But these forms are not Phacopinid and exhibit none of the profound specialization of the cephalon as seen in that subfamily. Slightly modified species of a similar nature are recognized in both the Ordovician and Silurian but are thought to be evolutions independent of *Phacopina* Clarke. They are provisionally left under *Dalmanitina*. Another slight modification is shown by some forms in which the glabella is broadly expanded anteriorly, but which retain the primitive pentamerism of *Dalmanitina*.

(3). The subfamily Phacopinæ Reed became differentiated at the very beginning of Silurian time and thereafter remained entirely distinct from the primitive generalized line. The profound modifications of this subfamily have been described by Reed and have been reviewed above. Probably the most diagnostic is to be found in the great reduction of the third pair of glabella lobes and the tuberculation of their extremities. Two stocks of this subfamily are of present interest.

(4). One of these Phacopid stocks is of wide distribution in the Silurian and continues into the Devonian, giving rise there to *Phacops s. str.* The more primitive and ancestral Silurian forms of this stock are placed under *Portlockia* McCoy, which is emended with subgeneric rank to receive them.

(5). The other Phacopid stock is that of the group of *Phacops glockeri* Barrande. *Phacopidella* Reed is now restricted to it. This confines it to the later Silurian stratigraphically and to the Tethys (Bohemia) realm geographically. Wedekind's generic name of *Glockeria*, also applied to this group, is untenable, being preoccupied by *Phacopidella* Reed.

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INSTINCT MINUS EXPERIENCE.

The more we study nature the more obvious it becomes that the mysterious intuition called instinct is not as perfect as some of the old school observers imagined. Just what this inherited memory is we are as far from thoroughly understanding as ever; but study, observation and experiment are bringing to light some of its limitations. We know that it does not spring into being; perfect and complete, like Minerva fully armed from the head of Jove, but is often only a starting point, a suggestion or a natural aptitude requiring experience and practice for the full development of its possibilities. This was admirably illustrated by a nest built by a pair of Baltimore Orioles in a garden in Ottawa South last spring.

The nest was hung from near the end of a long horizontal bough of Manitoba maple. When first started the nest was some ten or twelve feet from the ground, but the subsequent weight of the foliage brought it down until almost within reach of the hand and with the added weight of the first rain, it almost trailed on the ground; whilst a twist given to the branch by unequal loading spilled out the contents. The nest itself was very shallow and so poorly constructed that it could be seen through in every direction and the contained eggs were visible from below. Attempts were made to prop up the branch and correct its twisting but without effect and after three eggs had been spilled out as fast as deposited the nest was deserted.

The illuminating part of the episode lay in the fact that this pair seemed to be young birds and probably this was their first attempt at nest building. The male was certainly a yearling as was indicated by his dull colour. The age of the female could not be ascertained by her plumage, but her association with a juvenile mate makes it probable that she too was in her first breeding season.

To these familiar with the beautifully woven and deeply pocketed Oriole's structure hung from the pendant tips of high flexible branches, this slovenly, ill-judged nest is a curiosity. Fundamentally it followed oriole tradition but in execution it violated every principle of oriole construction. It was hung from a horizontal instead of a pendant branch; it was shallow instead of being deeply pocketed, and thin and open instead of being thick and densely woven and indicated that whilst the inherited ideal was there the fault lay in poor judgment and the lack of technical ability. It is to be regretted that absence from the city prevented the observer from discovering where the new nest, that was immediately started, was located and comparing it with the first abortive attempt to see what advance in skill, if any, had been made, and what had been learned by experience.

P. A. TAVERNER.

Geological Survey,
Ottawa, Ont., Aug. 10, 1918.

BRIEF NOTES ON THE FAUNA OF LAMBTON COUNTY, ONT.

By M. Y. Williams.

With the passing of the primeval swamps, have vanished the deer, wild turkey, and passenger pigeon which formerly abounded in Lambton and the adjacent counties of the Ontario peninsula. To-day wild life is inconspicuous, especially to passengers in the automobile. However, a few species of birds and mammals, either because of their size, color, numbers, or special liking for the roadside, can scarcely be overlooked.

To the visitor from Northern Ontario, or the Ottawa valley, perhaps the most conspicuous bird along the roadside and in the woods as well, is the tri-colored beauty, the red-headed woodpecker. His striking and contrasting coloring, of red, black and white, atracts attention, whether the bird is clinging to a tree limb, or telegraph pole, whether it is pursuing its undulating flight across the open fields or whether it is flying from tree to tree among the glades of the hardwood forest.

Although much rarer than the preceding species, the mourning dove may be frequently seen rising from near a bridge over a shallow stream, or clinging to a telephone wire, which seems unduly small for a bird of this size. The mournful wooing of this dove is a wierd sound indeed and its origin along with the call of the cuckoo is rarely recognized by the casual observer. In coloring and general appearance the mourning dove recalls the extinct passenger pigeon, which formerly swarmed over the country in countless myriads. Unlike its more noted relative, the mourning dove is a solitary bird during the early summer, and moves about only in family parties later on.

The one straggling survivor of the fine game birds of the early days, is the quail or bobwhite as it is appropriately called. In the early evening the low but distinctly whistled "bob—white," with a long pause between the syllables, may occasionally be heard from the open fields, and the fortunate observer may once or twice during the summer see a clean-cut cock quail sitting on the top of a fence post by the roadside. The brown and white markings and modified chicken-like appearance of this little "friend of the farmer" serves readily to distinguish it. Its insectivorous habits during much of the season should secure its protection, but its fine game qualities have kept it in the sportsman's eye and even now under nominal legal protection it is to be feared that it is still being persecuted by those who should be its best friends. If quail are again to become numerous, absolute protection for a term of years is essential. So far as could be learned, the quail of Lambton county are descendants of the native quail. I heard of no quail having been introduced.

The sight of turkey vultures circling low over the woods in the vicinity of Oil City and Oil Springs during the first week of August, suggested strongly a more southerly latitude. These large chocolate-brown birds, with naked, turkey-like head, follow the woodlands on regular beats, searching intently for carrion which is their favorite food.

Some years ago, Mr. Fletcher, who formerly kept the Fletcher House at Petrolia, now kept by Mrs. Fletcher and her daughter, Mrs. Bain, received two fluffy, white young turkey vultures from a farmer, and raised them successfully. They were quite tame and followed their owner about the town or perched on the roofs of the buildings. "Moses and Aaron," as they were called, were interesting specimens of domesticated wild life, but both suffered untimely deaths.

Of other birds of prey, the marsh hawk and sparrow hawk are the most commonly seen. A great-horned owl was disturbed one afternoon in the woods near Oil Springs, and was followed to its new roosting place by a noisy flock of robins. Either a long-eared or a short-eared owl was observed one evening near Wyoming.

Although there is little suitable water for waders and shore birds in the interior of the county, the great blue heron, American bittern, killdeer, and spotted sandpiper are fairly common. The black tern was observed along the lake Huron shore near Perch.

Of the smaller birds, the meadow lark is especially numerous, as have been the bobolinks. The horned-larks are fairly common, and the vesper is the commonest of the sparrows. Night-hawks and purple martins are very numerous at Petrolia.

Large flocks of bronzed grackles fly into Petrolia to roost at nights, to the discomfort and annoyance of the citizens near where they take up their quarters. Shooting has not driven them out successfully.

Black squirrels are occasionally seen in the woods of Lambton county and grey squirrels are reported; but the story related by one nature lover accounts for the scarceness of these fine, distinctive squirrels. He said "formerly the woods back of my farm contained a number of grey squirrels, but one day about two years ago a number of hunters came over from Sarnia and I haven't seen a grey squirrel there since." The natural increase of years wantonly destroyed in an afternoon!

Mr. Sam Lucas, who resides near Wyoming, keeps a fur farm and miniature zoological garden. Fishers, black foxes, rabbits, pheasants, etc., make up most of his stock in trade. In addition, however, he has two bald eagles brought when young from Manitoulin Island, and two sand-hill cranes, one of which, he states, has now been in captivity for more than fifty years. The cranes are in an enclosure where they stay voluntarily as their wings are not clipped. On request from their master, they throw back their heads and give the peculiar cry so familiar to those who have seen them on the plains of Saskatchewan. About the 20th of June one was sitting on hen eggs in an excavation in the ground which served for a nest. Her own infertile eggs, Mr. Lucas had removed. The two seen were about the size of turkey eggs, and were splashed with brown markings on a dirty blue ground.

N.B.—On the 19th of July the writer saw a yellow-bellied Sapsucker in the woods at Eugenia Falls, Grey County, Ont.

BOHEMIAN WAXWING AT OTTAWA.

On February 15, 1917, late in the afternoon, I saw a Bohemian Waxwing in a tree near my residence. It was surrounded by a group of curious sparrows. It flew to another tree, and the sparrows returned to their roof and held an animated discussion no doubt as to the identity of the stranger. Finally two of the hottest debaters flew to the second tree to make further observations of the waxwing. They inspected him quietly until he flew away, and then they returned and reported in calmer tones to the other expectant sparrows. I trust they agreed that it was "Bohemian" and not "Cedar." On March 16, and again on March 27, I saw a flock of Cedar Waxwings and three Bohemian Waxwings with them. On the latter date the Bohemian Waxwings sat quietly and nearly hidden among the brown leaves of a small beech at the Experimental Farm, while the Cedar-birds flew about on the nearby shrubs and trees. These are the first Bohemian Waxwings I have seen in Ottawa during ten years. A. L. Gormley reports one recently at Arnprior, (April 28, 1917, OTTAWA NATURALIST, XXXI, p. 32).

RALPH E. DELURY.

LEAST BITTERN NESTING AT LONDON, ONT.

(READ BEFORE THE MCILWRAITH ORNITHOLOGICAL CLUB.)

At "The Pond", two miles south of London, where many productive visits are made by the members of the McIlwraith Ornithological Club, in the seasons of migration, a red letter day occurred on May 30, 1917, when a Least Bittern, the first record for the pond, and the first local view for any of the members, gave them a leisurely display of his colors and actions.

Farther on, an unknown song was heard, which proved to emanate from a Prairie Warbler, the first County record, and a new bird for all the party.

Nothing further was heard from either of these birds in the spring of 1918, and apparently the visit was not repeated. What was our surprise, then, on the morning of August 2, 1918, while silently skirting the edges of the pond in a canoe, to find a fuzzy Least Bittern, perched on a dead twig, three feet above the water. Eventually we found all four of the young, as well as the two old birds, and during that, and subsequent mornings, they were invariably found roosting, where they seemed to have passed the night, from one to four feet above the water on the twigs of water-killed bushes, in which we thought they should be very safe. The young still had the whitish down of the nestling adhering in places, that on top of the head being very conspicuous.

Generally speaking, we would miss finding the parents, but would find the young, though occasionally, only one or two of the latter would be seen. For the benefit of those who have similar chances it may be remarked that we began the morning with a paddle around the pond at daylight, and found the time very propitious.

W. E. SAUNDERS, LONDON, ONT.

NOTE.

The Ontario Department of Agriculture has recently published Bulletin No. 263, on "Mushrooms of Ontario", the author being Dr. R. E. Stone. This publication of 24 pages emphasizes the importance of using wild mushrooms as food, particularly at the present time when a world shortage of food is threatened. Illustrations are given of twenty species. Descriptions of the various common kinds are given in brief as well as other useful information. Recipes for using mushrooms are also included, as well as directions for the growing of mushrooms.

THE OTTAWA NATURALIST

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THE CHIMNEY SWIFT.

By Charles Macnamara, Arnprior, Ont.

In general the scientific classification of our native birds seems reasonable enough. For instance, anyone can see the mutual relationship of the ducks, geese and swans included in the order Anseres; and the "hen-like" characteristics common to the turkeys, grouse, ptarmigans and quail embraced in the order Gallinae are very evident. And so it is with most of the other orders. Even the Passeres or Perching Birds, which form the largest division of all, comprising all the "smalle fowle that make melodie," diverse as the species are in many respects, are joined, most of them, by the manifest bond of song.

But there is one small order known as the Macrochires, that is calculated to disturb the enquiring layman by the dissimilarity of its species. For when he finds the grotesque whip-poor-will and the eccentric chimney swift classed with the exquisite humming bird, he is apt to harbour a dark suspicion that the systematist, finding at the conclusion of his labours several aberrant and unrelated forms left over, threw them hastily together into one miscellaneous order, and called it Macrochires.

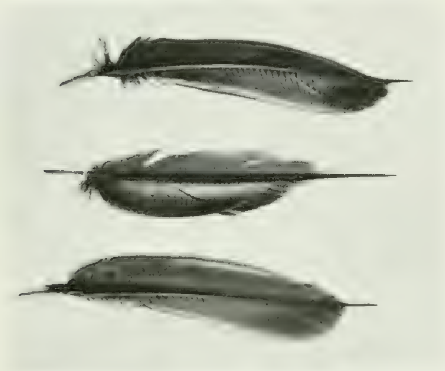
The suspicion, however, would be ill-founded. Different as the birds are in outward seeming, similarities in their anatomy indicate unmistakably a common line of descent. And if food habits afforded any evidence of relationship, it could be pointed out that the humming bird's taste does not differ so much as is generally supposed from that of its kinsfolk, the flycatching swift or whip-poor-will. While popularly believed to live exclusively on nectar, the humming bird in reality consumes large numbers of small insects; and when we see it delicately probing a blossom, it is actually looking as much for little spiders as for flower syrup.

But analogous food habits are no indication whatever of blood relationship, although they often bring about astonishing likeness in external appearance. The mammalian bat, seeking its prey in the air, has developed wings and attained the bird's power of flight. And the warm-blooded, air-breathing whale, making his living in the sea, is always taken by the uninitiated for a fish. But these are extreme cases, and the chimney swift offers a less violent example. This bird is not at all closely related to the swallows (which belong to the order Passeres), but catching its insect food on the wing in sustained flight exactly as they do, it has developed so many of their peculiarities, that not so very long ago ornithologists included it in the swallow family, and it is still very commonly called the chimney "swallow."

Swifts are found all over the world, but compared with many other like divisions of birds, the family is a small one, including only some seventy-five species. They are all noted for their wonderfully rapid flight, whence their popular name. But what distinguishes them most among birds is the remarkable mucus secretion of their salivary glands, used by the majority of them in the construction of their nests. Many species merely glue the nest material together with the secretion, but a genus in the eastern tropics *(Collocalia)* build their nests entirely of this gelatinous substance. These nests, from which the Chinese concoct their famous bird's-nest soup, are such strange productions that it is hard to believe that they are composed solely of an internal secretion of the bird. An ingenious native explanation of their origin, worthy of our own nature-fakirs, is that the birds obtain the mucilaginous shreds by annoying a large holothurian, common along the seashore in the east and known as a sea-slug, until the exasperated creature throws out long slimy strings at them, which they gather up and carry away for their nests. The less picturesque but equally incorrect theory of Western science was that the nests were mostly composed of partially digested seaweed. It is now known, however, that, leaving out of consideration some adventitious dirt, the nests of this genus consist of practically nothing but mucus.

About one-half of the known species of swifts are natives of the New World, but most of them are confined to the southern continent, only four occurring in North America. And of these but one, *Chaetura pelagica*, the familiar chimney swift, makes its summer home in the Eastern United States and Canada, where it breeds from Florida to Labrador.

The chimney swift is essentially a bird of the air and is known to remain for sixteen to eighteen hours continuously on the wing. While its length from beak to end of tail is only 5½ inches, its curved wings measure 12½ inches from tip to tip. These disproportionate dimensions, together with its small head and short neck, give the bird a very peculiar shape in flight. It is sometimes called the "bow-and-arrow bird," but it reminds me most of an anchor with a very short stock. The plumage is slaty black with some dark green reflections, the under parts being somewhat lighter, and there is little difference in the colouration of the two sexes. Its small weak feet are not very efficient grasping organs. Consequently the chimney swift cannot perch like other birds, and is never seen sitting on a branch, or roosting on the wires like the swallows. Except when on its nest, its only resting position is clinging to a vertical surface, in which posture it is supported by the curious spined feathers of its tail. Its rapid wing-beats, alternated by short soarings, sometimes with wing elevated over the back, lack the easy grace of the swallow's flight, but it surpasses the latter in speed and nimbleness. It is said sometimes to use its wings alternately, but I have never been able to satisfy myself of this. Its one and only note, which it keeps up very persistently in flight, has been described as a "rolling twitter." Chimney swifts are no songsters, and their dull plumage is not black enough to be dignified; but the quaintness of their crescentic forms darting across the sky with shrill artless twitter, is a delight to every nature lover. And if not beautiful, the swift is certainly very useful, for no bird does more to ward off the insect plague that constantly menaces mankind.



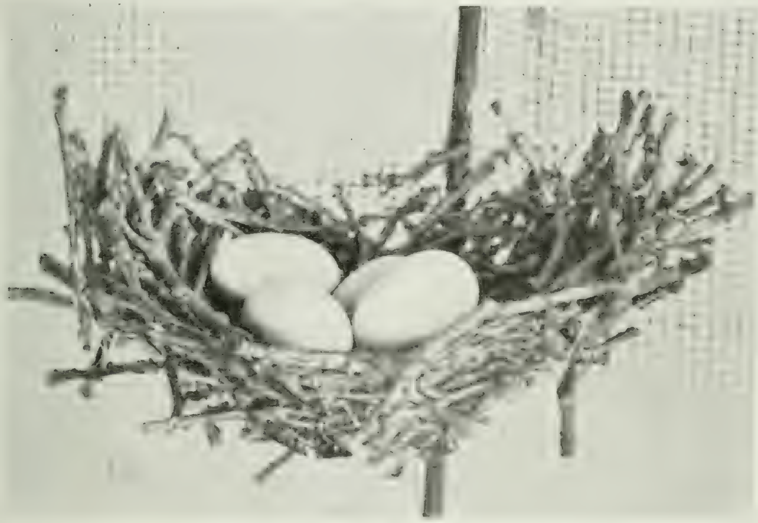
Spined tail feathers of Chimney Swift; natural size.

Chimney swifts are for us harbingers of summer rather than of spring. They do not arrive in this district until about the sixth of May, some four weeks after the swallows and martins; and it is only towards the end of June that they begin house-keeping. They are now seen frequently flying in threes, which has caused some writers to surmise that the birds are polygamous. But this is an aspersion on their character. What we are really looking at is that thread-bare theme of the novelist known as the "eternal triangle"—the courtship of a female by two males. To us the uniformity of plumage among the males would seem to preclude the choice of the female being affected by anything analogous to those points considered so extremely important by the young human suitor, such as the fit of his clothes, color of his necktie or the way he brushes his hair; and it would appear that the lady swift must decide for the wooer with the shrillest voice or the freest wing action. But whether her choice be made on these or some more subtle grounds, she soons picks out a mate, and the serious business of nest building commences.

The chimney swift is one of several native birds that have greatly changed their nesting habits since the arrival of white man in America. A few conservatives of the species still observe the primitive practice of building in caves or hollow trees, and occasionally a nest is found attached to the inner wall of a shed or outbuilding; but the great majority of them justify their popular cognomen by nesting in disused chimneys. All the life activities of the swift, except sleeping, egg-laying and hatching, are performed on the wing, and even the twigs of which it builds its nest are gathered in full flight. Hovering a moment over a dead and brittle branch, it drops with elevated wings, and grasping at a dry twig with its claws, breaks it off and flies away with it. (It is stated that it sometimes breaks twigs off with its bill, but I have always seen it use its claws). Eight or ten feet down inside the chimney it glues these twigs to the wall and to one another with its viscous saliva, building them into a shallow semi-circular nest, about 4 inches wide, and projecting about 2½ inches from its support. The natural glue secreted by the chimney swift seems to be practically insoluble. Prolonged soaking of a nest in water causes the adhesive to swell and soften, but does not melt it. Even boiling water fails to liquefy it, and on drying it becomes quite hard again and holds the twigs together as firmly as ever. No doubt this insolubility ensures the nest holding together in wet weather; but it must be said that sometimes the rain softens the attachment to the wall and the weight of the nestlings causes a disastrous fall.

Generally the chimney swift builds in such inaccessible situations that it is not easy to observe their domestic arrangements. One year, however, an unusual chance was offered by a pair who fastened their bracket nest to the inside of a wire fire-guard on the hearth of an unoccupied and shuttered summer cottage at Marshall's Bay on Lac des Chats. I had no opportunity of observing the actual building, but the birds seem to have stuck a few twigs here and there on the wires before finally deciding that the right place for the nest was near the top of the guard and about the centre.

The nest, which was a good typical example of chimney swift architecture, was finished about the 25th June, and the last of the four elongate white eggs was laid on the 1st July. Authorities differ as to the incubation period of the chimney swift, some giving 10 to 12 days, while others hold out for 18 days. In this case the young hatched in 16 days, for on the 17th July there were four naked and blind little ones in the nest. They grew at an astonishing rate. By the twenty-fifth of the month, though their eyes were not open yet, they filled the nest to overflowing, and any other young birds not so well fitted to hold on in precarious places, would certainly have fallen out. Only three birds can be seen in the photograph, but the fourth was there, apparently half smothered under the others. Humanly speaking, their position looked fearfully uncomfortable. But we must avoid that deadly sin of science: anthropomorphism. Despite appearances, we may be sure that the swiftlets were as much at ease in their crowded nest as the most cherished human babe in its luxurious cot.



Nest and eggs of Chimney Swift; about natural size.

At any rate their appetites were not suffering, for they clamored incessantly for food with an incredible cry more like the metallic rattle of a mechanism out of order than the voice of a living creature. This loud rasping noise is sometimes only too familiar to an unfortunate individual trying to sleep in a room, the chimney of which has been the fatal choice of a pair of swifts. The parents do not hunt all night as sometimes supposed, but as remarked by Mr. A. G. Kingston in the *Ottawa Naturalist* 25 years ago, they take turns at brooding the young, and the roaring of their wings in the chimney as they change places every half hour or so, added to the raucous chattering of the disturbed young, makes sleep quite impossible.

By the 30th July my young swifts were well feathered, and the spiny quills of the tail had appeared. I did not see them leaving the nest, but some day early in August they must have crawled and fluttered up the dark chimney to the sunshine and the sky, and launched out on fledgling wings, for on the 10th of the month they were gone.

Their departure was acclaimed with unfeeling joy by the family who had been induced—but only under strong protest,—to postpone their usual occupation of the cottage until the young birds were gone. And I regret to say that every year since, ignoring the expostulations of the naturalist anxious to investigate further the home life of the swift, the last callous act of the family in the fall before leaving the cottage, is to place a board over the top of the chimney.

According to Audubon, sometimes thirty or more pairs of swifts used to build in the same hollow tree; but nowadays their habit is solitary, and it is rare to find two nests in the same chimney. Both before and after the breeding season, however, they are essentially gregarious, and gather—sometimes in immense flocks—to pass the night together in some large chimney or similar shelter. On such occasions they may be seen at dusk flying over the chimney in a close swirling cloud, which gradually assumes the shape of a hollow inverted cone; and from the bottom of this living whirlpool, the birds drop continually into the chimney until all are within. Audubon relates that in his time seven or eight thousand swifts congregated thus in a large hollow tree near Louisville, Kentucky. And in his interesting article in the *Ottawa Naturalist* already referred to, Mr. A. G. Kingston tells of the enormous flock that used to gather nightly in a ventilating tower on the Parliament Buildings at Ottawa, the number of birds being estimated by Mr. Kingston at from nine to ten thousand. But these are exceptionally large congregations, attracted together, no doubt, by the size and convenience of the shelters. Usually the flocks number only a few hundreds. The swift population of Arnprior divides up in the fall among several chimneys in the town, the most numerous assemblage—perhaps three or four hundred birds—occupying one of the large chimneys of the Roman Catholic Church, while smaller flocks take refuge in a couple of store chimneys.

If the chimney swifts come later in the spring than the martins and others of the swallow tribe, they make up for it by staying longer in the fall. Most years they are abundant around Arnprior until nearly the middle of September, when they suddenly disappear, the whole flock evidently having flown off to the south altogether. But Mr. Liguori Gormley, who keeps a careful watch on bird doings in this district, informs me that usually, after a period of ten days or so during which not a swift is to be seen anywhere, a few will be observed towards the end of the month flying over the town. These are apparently birds that have nested much farther north, and now, responding to the hereditary impulse of their race, are directing their course like the others for Yucatan or Nicaragua, with that unerring sense of direction, which, although commonly exhibited by many creatures, is a marvel to man because in the course of his evolution, he has largely lost it.

Young Chimney Swifts about one week old: natural size.

THE A B C OF FOSSILS.

By Lancaster D. Burling.

We shall start out with a definition which would do if we were writing a scientific treatise but we shall make every effort to break away from the technical method in what follows. As the definition will show, however, even the technical may be perfectly simple, and might often be more so than it is.

Fossils are direct evidences of life preserved by natural burial in the rocks of the earth's crust.

Fossils therefore represent life and occur in rock, but they need not be the actual remains of plants or animals, and the rock need not be the hard substance which we usually think of when we hear that term. In fact many beds of sand, mud, clay, and marl come within our definition, and all hard rock, with the exception of those that are igneous or volcanic, was once soft. It has been hardened by pressure, heat, and cementation (cement-ation) during the ages that have passed since it was first laid down.

Although a layer of lava (molten rock) flowing into water has been known to trap clams that were crawling over the chilled surface of a previous layer of the same kind of rock, and fossil clam-bakes of this kind have been found on Vancouver Island, for example, fossils are almost always confined to sedimentary rock. By this we mean rock which has been formed from wind-blown dust or sand; from the mud, sand, or gravel in river beds or valleys; from the sediment which falls to the bottom of ponds, lakes, or oceans; from the material piled up or carried by ice rivers, or glaciers; and from deposits for which animals and plants are responsible, for example coral reefs and coal beds. It will easily be seen that sand or mud settling in water would arrange itself in comparatively flat layers, but all sedimentary rocks, whether thrown together by the wind, by a river, by the waves, or by a glacier are piled up in similar layers; they are stratified to use the proper term, and this stratification is often surprisingly regular.

The amount of mud and sand which is being carried by rivers into the ocean, where it must of course all settle, has been computed for the Mississippi, but instead of giving you the number of billion cubic feet a year or the number of hundred million tons a year let us suppose that someone should put in the plant needed to strain this mud and fine sand out of the water before it reaches New Orleans and should send it past that city in canal barges. If these barges were 100 feet long the people in New Orleans would see a barge full of sand pass every 10 seconds or less, and since it would take the river 30 seconds to float a 100 foot barge past a given point the barges would have to pass in bunches of three and there could be no space between the back of one set of three barges and the front of the next. If the man we have imagined were to take care of all of the sand and mud for a year he would have to work day and night, Sundays and holidays, winter and summer, and never allow an inch of space between each set of three barges. If these were to dump their loads in the Gulf of Mexico the sand would settle in piles but the river spreads it out very widely and sends enough material each and every year to spread a one inch carpet over more than 3000 square miles of the gulf's bottom.

This gradual piling-up process, one which takes place on land as well as in the water, affords a continual opportunity for the natural burial of the remains of the animals or plants that die and drop to the bottom. Those remains that do not decay and are preserved, however this may be done, are called fossils. So also are the casts or molds of animals that do decay, their footprints, etc. Whatever the form of the evidence that the animal or plant once lived, it simply must be direct, and whatever the manner in which the burial took place, it must have been by natural means. For example, hard coal, though we know it to be formed of plant remains, is not a fossil, the evidence is indirect; and a dog does not make a fossil, or even start one on the way, when he buries a bone. The latter may be a perfectly natural thing for the dog to do but it does not come within our definition of the term natural, a fact which will be perfectly clear before we are through.

An animal tries to cross a slough and gets mired, or sinks in quicksand, another breaks through the hardened surface of a tar pool and disappears, a jelly-fish is stranded on a tidal flat and the next tide covers it with a layer of sand or mud, an animal walks across some drying mud and the next rain washes sand into its footprints, an insect gets caught in a drop of resin, a mammoth is frozen in the ice in a polar climate, an animal dies on the desert and its whitened bones are covered by the next sand storm, a leaf sinks to the bottom of a pool and is covered with mud, a snail or a clam dies and the shell lies on the bottom of the ocean until it is covered, a coral or a sponge growing on the bottom is smothered by a shifting of the current which covers it with sand.

All of these may, and have for that matter, become fossils; it is only necessary that the mud or the tar or the sand or the resin or the ice shall be preserved (obviously it can not be washed away or destroyed without destroying the fossil), and that the footprint or the shell or the bone or the leaf, or its impression, shall be preserved as well. This is made easy by the hardening of the mud or sand into rock, a process which is sure to follow if the material is given enough time. If the jelly-fish can hold its shape until the layer of mud has hardened, smaller particles will gradually filter into the cavity which it leaves, and these may be different enough from those around it so that when the rock is split apart on this particular layer the shape of the jelly-fish can be seen. The cavity may even become filled with calcite or a similar mineral. The two layers of mud that pressed the upper and under sides of the leaf may show its form and outline even though the leaf decay. On the other hand the shell or the bone, or even the entire body, as in the case of the mammoth, may be preserved as it is, without change. Sometimes, however, only the tube or burrow in which the animal lived is preserved.

Still another way in which fossils may be preserved is best described by supposing that you were to change a picture, a mosaic, which owed its features to the skilfull arrangement of differently colored berries by substituting for each berry a pebble of the same shape, size, and color. You would have changed nothing about the picture but its lasting qualities, you would have made it safe from decay. It is this process in nature but on a very much smaller scale which has given us such fossils as petrified wood. The exchange of particles is here so fine that the smallest details of structure are preserved and may be studied under the microscope.

Now many of the softer rock deposits are exposed at the surface of the earth and man has cultivated the layer of soil immediately above, but they were laid down, formed, ages ago and during the lifetime of the animals and plants whose remains can now be found in them. As we have said these are the real fossils. If a farmer living on such a soil should dig down three or four feet and bury a dog that dog would not become a fossil even though the bones did not decay and were to be dug up thousands of years later together with the remains of the real fossils. It did not get where it is in the ordinary course of events, man put it there. If the real fossils were dog bones it might be difficult to separate the fossil dog bones from the farmer-buried dog bones. But it would be almost impossible to mix a group of animals that had lived on the earth for any great length of time prior to another with that other, so that the fossil expert, for whom the term paleontologist is in common use, could not detect the mixing. If one bone or shell did not give the fact away another would, and even the two sets of dog bones would probably differ from each other, for animals and plants have always changed from age to age. It is this progressive change in time which we call evolution.

If the person who dug up the fossil bones and the farmer-buried dog bones had looked closely he would have seen that the earth around the farmer's dog had been disturbed, that the lines of bedding (stratification) in the nearby rock stopped some distance from the dog and that the earth near it was jumbled together; also that this was not true with regard to the bedding near the fossils. It is this care in collecting and attention to detail which is natural to paleontologists, and which others must make use of when they collect fossils if these are to have any value. Many of the doubtful points in the earth's history, such as whether the human bones which have been found in certain places in our West, or in Argentina, are those of primitive man or those of recent natives were made doubtful by carelessness or lack of observation on the part of the person who first made the discovery.

Nature has been very careful about recording what she has done, however careless she may be in destroying that record, and fossils may be likened to the hieroglyphics which the Egyptians used to carve, in more ways than one. They, the fossils, are Nature's handwriting, her method of labelling the rocks of the earth's crust, and while fossil hieroglyphics are sometimes hard to read, and while they, like those of Egypt, mean little or nothing to the ordinary person, their story is easily read by the man who knows.

Perhaps we can better illustrate the use of fossils by comparing them to the documents placed in the foundation stones of buildings. It is customary to seal up in such stones objects like the daily papers of the date upon which the stone is laid, coins, etc., anything which will indicate to the one who opens the vault, whether this be done in a hundred or a million years, and when every other evidence as to the age of the building may have been lost, the exact period of the earth's history during which the building was erected. Nature has sealed up in rocks of all ages but the oldest, in all but a few varieties, and in nearly all places, articles (fossils) which convey an accurate idea of the relative time at which the different rocky tombs were built, and we are daily becoming more expert in reading the story they tell.

Since fossil experts in all countries are continually at work on these problems, and since an expert in Japan, for example, should know exactly what a

Canadian expert is writing about, we have agreed that all fossils shall have Latin names and that these names shall be used at all times whether the work is written in Japanese or English, or any other language. Since the presence of the same name for two or more things would introduce even worse confusion between the workers in the different countries we have also agreed to give different names to different animals and but one name to similar animals wherever they may be found. This is the only method by which we can speak of or compare accurately and intelligently the fossils occurring in different countries, but since we already know and have described and illustrated several hundred thousand different kinds of fossils some of the names are a little complicated. This explains the unusualness of names such as those in the papers by Whittaker in the April number of the Naturalist and by Lambe and McLearn in the May number. Instead of John Jones, William Jones, and Mary Jones we speak of Jones John, Jones William, and Jones Mary, or to use real fossil names, *Obolus parvus*, *Obolus major*, and *Obolus typus*, putting the important or group name first as do the Chinese. Li Hung Chang is Mr. Li, for example, a change we have to make whenever we get out a directory, a telephone book, or an index, but which the Chinese and the fossil experts do not.

Now let's go back to the farmer's dog. You will remember that we decided that it did not come within the definition and therefore was not a fossil, but supposing the farmer had dug up some fossil bones from another farm, fossils that lived earlier and were therefore really older instead of younger, as the dog was, and buried them in the same way. These would of course be fossils; they were and the fact of their having been moved did not change their nature, but once again, it would take a very expert farmer (a very expert paleontologist in fact) to fool any paleontologist this way. Curiously enough, however, Nature herself has done many things, things which must be included under the head of natural burial, much more confusing than anything we have supposed the farmer to do. Old sea bottoms with their included fossils have been hardened into rock, elevated above the sea, cracked, and the cracks widened by the wear of running water or frost just as such cracks, or joints, are being widened today, and animals living millions of years later have dropped into these cracks and been covered up and preserved. What real difference is there between the farmer-buried dog three or four feet down in a grave beside fossils thousands or millions of years *earlier* than itself and fossils 15 or 20 feet down in a crack beside fossils that much earlier than themselves? None, except that the one is natural, the other artificial, but when we are dealing with fossils this difference is essential. Again, other sea bottoms, hardened into rock and elevated above the sea, are being gradually worn away by agencies which are unable to dissolve the harder included fossils and these weathered-out specimens are being picked up by storms and washed into the ocean to lie on the bottom with animals which have just died. The next layer of mud will cover both, the recent animal and the million year old fossil, and when the new sand has hardened into rock the two forms will be found in the same grave. What real difference is there between the farmer-buried fossils in a grave beside fossils thousands or millions of years *later* than themselves and the nature-buried fossils lying beside fossils fully as much later than themselves? None, except, as in the former case, that one just happened, it was the natural thing, the other was man made and accompanied by an act of will.

If you wonder why paleontologists do not include under the term fossils *any* direct evidence of life preserved in the earth's crust we shall have to say that the evidence of man's interference may be lost and can be hidden, and that his ability to transport animals or plants long distances without leaving any trace as to their source, his conscious interference with the natural course of events, irrespective of the motive, introduces complications which warrant us in putting the limit we have assigned and insisting on natural burial. As a matter of fact we usually confine the term fossils to the evidences of life which have been preserved to us from the prehistoric period, popularly speaking, but the study of fossils and the study of biology merge so closely together that they can not be separated. So do the study of fossil or "prehistoric" man (paleontology) and the study of early or historic man (archaeology).

If you think our illustrations have been too complicated we can only say that Nature has been known to still further confuse the whole problem by turning a whole series of such rocks completely upside down and by scraping half or three-fourths of them away and otherwise disturbing them during the process which has elevated them above the sea. Furthermore we have taken up only a few of the problems which are involved. The animals and plants that peopled the earth at any one time millions of years ago, for example, differed from place to place and from country to country fully as widely as do the animals and plants of today.

The study is so complicated that few geologists care to postpone the beginning of their period of full activity as working geologists by the number of years of preparation required for even an elementary understanding of the story told by the fossils occurring in the rocks which they will study. Those geologists who do wait to become paleontologists stand in the same relation to the geologist that the student of ancient history who can read its picturesque language does to the student of ancient history who can not.

Paleontologists are forced by the broadness of the subject, however, to specialize and usually confine themselves to certain groups of animals or certain groups of rocks, the usual unit of animals being some such group as snails, crabs and crablike animals, corals, or sponges, or even lesser groups. The usual unit in rocks is one covering a period of several million years, a unit which is perhaps best described as a tenth, roughly speaking, of the time since life began to leave its traces in the rock.

If the story of the changes which have taken place in the life on our earth is complicated, so is the story of the changes through which our earth has passed, and the one could not be read without the other. But having observed the order in which the rocks were laid down in favorably located places we are able to study life as it has existed from age to age, and we arrive at evolution, or the idea of a progressive change in life forms as we go from the earlier to the later. Knowing the history of these life changes on our earth and being able to recognize their different stages in the fossils which fill so many of our rocks we are able to trace rock horizons from place to place in unfavorable places, across lakes or seas and underground.

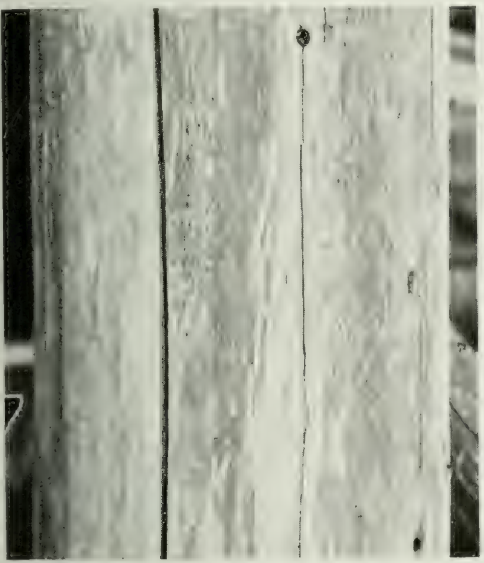
Most of our mineral deposits: coal, iron, oil, salt, etc., etc., occur in such rock horizons, layers whose position in the general order is known, layers which either have fossils peculiar to themselves or lie between layers which do. For example, and space will permit us to give only one: Sands in a certain section of California are found to contain oil. Similar sands show at the surface in many other places, are mapped by the geologists, and wells are bored wherever the sands occur in the hope of striking other oil wells. The sands are thick and boring is expensive, roughly $10,000 for every well sunk, yet the return on the few which reach oil is sufficient to induce private capital to go ahead. A paleontologist is sent out to the field by the official survey and finds that the supposed sand horizon is not one but two, that these are separate and distinct, each with its own particular group of fossils, that they are thousands of feet apart vertically, one being much older than the other, and that only one of them carries oil. He visits the various sand showings, or outcrops as they are called, and maps the distribution of the oil-bearing sand. He is thus able to cut down the absolutely useless drilling, or "wildcatting" as it is called, by one half. If the sand is the oil-carrying one conditions of internal or external structure will affect the location of oil pools but drilling has a chance of success; if it is not the time and money used in drilling are absolutely wasted. A man on a nominal salary, as a part of his regular work, saves the expense of drilling hundreds of useless wells, any one of which would have cost four or five times his salary for a year. The error which private industry is somewhat prone to fall into is the hiring of poorly trained geologists, or men who merely call themselves such, a poor policy in spite of the fact that almost any geologist or pseudo-geologist is better than none. The paleontologist mentioned, for example, and his case is not unusually exceptional, was worth ten times his government salary to any one of the oil companies in California and of course his real value to the country at large, or to the government which employed him, could be measured by the same amount.

For the reader who should question the dispatch of a government geologist for the saving of large sums of money for private industry we shall have to say that the present development of our mineral resources depends in large part upon the far-sightedness and public-spiritedness of private industry; that every dollar which they take out of the ground adds to the sum total of the wealth which we all share, to however small a degree; and that every dollar which they are kept from wasting is left in that same sum total. If they pay it out uselessly it might better be thrown away, because the drilling of the useless well wastes also the time of labor which might have been engaged in productive work. This is elementary economics, not paleontology, but fossils have a dollars and cents value which is sometimes lost sight of. To place it before you in a general statement: Geologists and paleontologists take from mining, second only to agriculture as the leading industry of North America, a large part of its luck or chance, and give it an element of certainty which is of inestimable value to it and to the country at large.

THE ORIGINAL PAPER-MAKERS.

By Charles Macnamara, Arnprior, Ont.

It has often been pointed out that the most indispensible substance in the world for mankind is the green coloring matter of plants known as chlorophyll, for it alone can transform the innutritious solids of the earth and gases of the air into food for us and for the animals we prey upon. But immediately after the food-producing chlorophyll must be ranked as next in importance another vegetable product, cellulose. This material forms the greater part of the rigid skeleton of trees that we call wood, and is the principal constituent of all vegetable fibres, such as cotton, linen and hemp. The timber with which we build and furnish our houses is mostly cellulose, and all our textile fabrics of vegetable origin are practically pure cellulose. And besides providing mankind with such primative necessities as shelter and clothing, of the countless commodities demanded by modern society, it supplies a large number, ranging from high explosives to artificial silk. But of all these more sophisticated products of cellulose, the most vital to the civilization of to-day is undoubtedly paper.



The light streaks show where V. maculata has been gathering wood fibre.

The supreme importance of paper in the modern world is not always realized. True, the rulers of Germany know now that even a scrap of it may be of the gravest import; but that the whole fabric of civilization is bound together by paper is seldom apprehended. Paper is the guardian of all the records of mankind. We are the heirs of all the ages, because paper has preserved our heritage for us. It is the chief agent in the diffusion of knowledge, without which progress is impossible, and in a thousand unconsidered ways it is woven into the complex of modern culture. And yet, essential as it is to man, it was not he who originally invented it.

Apparently manufactured by the Chinese before the Christian era, paper was not known in the Western World until introduced by the Arabs in the 8th or 9th centuries A.D., when it soon spread over Europe. For hundreds of years it was made principally from linen rags, but with the enormous growth of newspapers in the 19th century this source became inadequate, and about fifty years ago, paper began to be made direct from the cellulose of wood. Now vast forests are felled annually to provide us with our daily portion of more or less reliable news.

But long before the Arabs or the Chinese, countless ages even before our paleolithic grandfather chipped his first stone axe, wasps were making paper from the cellulose fibres of wood by practically the same method as that followed in the latest improved mill of to-day. The whole process of paper manufacture from wood virtually consists in separating the flexible cellulose fibres from the softer parts, dissolving out the gums and oils, eliminating the coloring matter, and lastly, with the addition of size to give the material substance, felting the fibres into sheets. The human manufacturer attains these ends by means of massive machinery and corrosive chemicals. The wasp leaves it to the slow inevitable chemistry of the sun and rain to free the wood of gums and oils, her salivary glands provide the necessary size, and she uses her powerful jaws to loosen and manipulate the fibres.

As is generally known, wasps belong to the Hymenoptera, that large and dominant order that includes, besides our old friends the bees and ants, a large number of more uncommon insects, such as saw-flies, ichneumons, gall-flies, horntails and chalcids. The best paper-makers among the wasps are found in the genus *Vespa* which comprises some forty species distributed the world over, and all social in their habits. Their colonies are composed of queens, males and workers, similar to the communities of their close relations, the social bees and the ants. Some Vespas construct their nests in hollow logs or holes in the ground, and as Nature never wastes any time in works of supererogation, the paper manufactured by these subterranean species, while amply good enough for the protected situation, is but a poor coarse material compared to the strong flexible product of the kinds that suspend their familiar silver-grey nests in trees. Of the seven or eight species of Vespa occurring in the Ottawa district, the commonest bears the sinister name of *Vespa diabolica;* but our largest sized representative of the genus, found right across the continent from Nova Scotia to British Columbia, is *Vespa maculata*, popularly known as the bald-faced hornet, and it may be taken as typical of the most accomplished paper-makers.

V. maculata, which is heavy-bodied for a wasp, wears the traditional wasp livery of buff and black, and owes its popular name to the pale yellow markings on its face. As is usually the case among the social Hymenoptera, the males are larger than the workers, and the queens are larger than the males. The bald-face hornet's chief mental characteristics are a very short temper and an extreme intolerance of strangers near its nest; and it is armed with a powerful sting as many people can feelingly testify. Indeed, a friend who sometimes bears me company on biological expeditions, and who is not at all of a timid disposition, suffers from what may be termed "wasp-shock". Some years ago he incautiously sat down near a hornets' nest, and was severely stung. And now, so far from assisting in the observation of Vespan economy, the very sight of a nest causes him—in the German war-office term—to retire promptly to a prepared position in the rear. Contrasted with the complicated activities of the honey bee or the still more marvellous organization of the ant societies, the life history of a colony of *V. maculata* is comparatively simple. It is rather doubtfully stated that males and workers may sometimes hibernate in the nest, but in general it appears to be only the young fertilized queens that live over winter, sheltering under bark or in rotten logs. On several occasions in the early spring, I have found torpid queens in such situations, but so exposed to the winter cold, that it was a mystery to me how they had survived. Many of the invertebrates—and some of the lower vertebrates too—are extraordinarily resistant to cold. A degree of frost that would be absolutely fatal to a mammal, has no more effect on some insects than to render them temporarily torpid, and on the first rise in temperature, they are as active as ever.

Emerging from her winter quarters with the first fine weather of spring, each queen sets to work to found a colony. She seeks a sound but weather-beaten surface of wood, and working backwards in the direction of the grain, with her strong jaws she gnaws off the outside fibres along a narrow strip, leaving the brighter colored wood exposed beneath. The cedar logs that form the verandah posts of a log-cabin on the shore of the Ottawa at Marshall's Bay, are much frequented by wasps for wood pulp, and some parts of the posts are fairly striped with the numerous tiny furrows left by the workers gathering their supplies. The fibres obtained, she chews them into a paste with a viscid secretion from her salivary glands, and with this material she shapes a tiny globular nest about 1½ inches in diameter, consisting of a couple of layers of paper, enclosing a single horizontal comb of eight or ten cells, opening downward. The nest is often attached to the eaves of a building, but usually it is hung from the branches of a tree at some height from the ground. The favorite habitat appears to be a swamp, possibly because there is less disturbance there from passersby; although no passerby with the slightest knowledge of the habits of *V. maculata* is ever anxious to raise any disturbance with them. The paper is somewhat open in texture, but is remarkably strong and flexible and is quite waterproof. The sheets are formed by the accretion of tiny ribbons of pulp, as can easily be traced in the variegated structure. Some Vespas are said to strengthen their paper with herbaceous filaments gathered from growing plants, but I cannot say that I ever observed this myself. The comb material is much thicker and stiffer than the casing paper, and resembles a rather soft cardboard. The light grey color of the paper blends well with the general tone of the bark, and consequently the nest is not a very conspicuous object in the branches.

When her nest is ready, in each cell of the comb the queen lays an egg which hatches out in a few days. Then for a couple of weeks the devoted mother works early and late to feed her unattractive young grubs—first with regurgitated flower nectar, and later with masticated parts of caterpillars—until they transform into pupæ. The pupal stage is short, and the perfect insects soon emerge. The first broods consist entirely of workers, the queens and males not appearing until towards the end of the season. The young wasps begin work immediately. The beauty of instinct is that it is instinctive. The young workers need no domestic science course to teach them their duties in the nest, but take over the management at once, and the queen, relieved of all housekeeping responsibility, has nothing to do but lay eggs.

The workers, whose numbers are constantly increased by the advent of new broods, now busily forage for supplies and feed the larvæ. And to accommodate the rapidly growing family, they keep tearing away the paper casing inside the nest and adding larger sheets outside. The combs, too, are continually enlarged by the addition of concentric rings of cells, and new layers are built, each suspended by a strong stalk from the layer above; until the nest may consist of a casing of eight or nine sheets of paper a foot or more in diameter, containing half a dozen layers of comb, and sheltering thousands of wasps. Apparently only the younger wasps (distinguished by their smooth perfect wings from the older workers whose wings have become frayed) are capable of paper-making, they alone secreting the necessary mucus in sufficient quantity. Unlike the slothful drones of the honey bee, the male wasps, who appear with the young queens in the later broods, take an active part in the affairs of the colony, and gather food and care for the young as industriously as their sisters, the professional workers.

Our wasps cannot be accused of food-hoarding. They use their comb as a nursery only, and never lay up supplies in it, like the honey bees. They take no thought for the morrow, but trust to Providence every morning for their daily bread. And a remarkably comprehensive taste in victuals must make it comparatively easy for Providence to cater for them, their bill of fare ranging from flower nectar—that most ethereal of foods—to the gross corruption of rotten fish.

The colony's activities diminish with the cooler weather of autumn, but the routine of the nest continues to the last. Winter always seems to surprise them, as death does mankind; and frozen larvæ and pupæ as well as the bodies of the last few faithful workers are generally to be found in the nests in the winter. Before the cold weather, the young queens mate with the males, presumably from other nests, and crawl away into crevices to wait for the spring. But the courageous tireless paper-makers and foragers, who wrought, single-thoughted for the community's good, from dawn to dark the summer through, all perish with the first severe frost. And now the craven naturalist, who did not dare to approach within many yards of the nest while its fearless defenders were alive, can carry it home in a cheap triumph, as a trophy for his room.

TOURMALINE FROM MACDONALD ISLAND, BAFFIN LAND.

By A. Ledoux, Toronto.

A small crystal of tourmaline was associated with the minerals from Baffin Land described by Prof. T. L. Walker.* This crystal is about six mm. long and four mm. wide. It is dark bottle-green by transmitted light, black by reflected light. The antilogous pole is broken, the other one shows some very fine faces. Following Dana's orientation, they correspond to the upper half forms of: the positive rhombohedron of the first order, p, (10$\bar{1}$1); the negative rhombohedrons of the first order, o, (2$\bar{2}$01) and e, (1$\bar{1}$02); the positive scalenohedrons u, (32$\bar{5}$1) and q, (11.5.$\bar{16}$.2). In the vertical zone there are several prisms, the one most developed being a positive trigonal prism of the first order, m, (10$\bar{1}$0); the edges of this prism are replaced by other small prism faces, belonging to the negative trigonal prism of the first order m′, ($\bar{1}$010); the hexagonal prism of the second order a, ($\bar{1}\bar{1}$20); the positive ditrigonal prism k, ($\bar{3}$120). The unequal development of the various prism faces gives to the crystal the appearance of a trigonal prism with rounded edges.

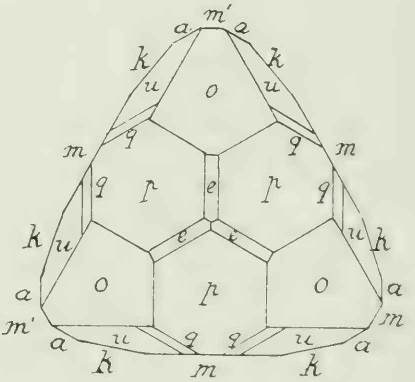


Fig. 1.

A projection of the crystal on the plane 0001 is given on Fig. 1. The measurements were made by a two-circle reflecting goniometer: they are indicated in the following table and may be compared with the calculated angles ϕ and ρ as given by Goldschmidt in his Winkeltabellen.

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*Minerals from Baffin Land. The Ottawa Naturalist, 1915, p. 63.

No.	Letter	*Reflections.	Symbols (Miller-Bravais)	Measured		Calculated	
				φ	ρ	φ	ρ
1	k	p	$2\bar{3}10$	8°45′	90°00′	10°53′	90°00′
2	m′	vg	$1\bar{1}00$	0 05	90 00	0 00	90 00
3	a	vg	$2\bar{1}\bar{1}0$	29 59	90 00	30 00	90 00
4	k	p	$3\bar{1}\bar{2}0$	9 57	90 00	10 53	90 00
5	m	g	$10\bar{1}0$	0 00	90 00	0 00	90 00
6	a	vg	$11\bar{2}0$	29 57	90 00	30 00	90 00
7	k	g	$12\bar{3}0$	10 59	90 00	10 53	90 00
8	a	vg	$\bar{1}2\bar{1}0$	29 57	90 00	30 00	90 00
9	m	g	$\bar{1}100$	0 07	90 00	0 00	90 00
10	k	g	$\bar{3}210$	10 57	90 00	10 53	90 00
11	a	vg	$\bar{2}110$	29 56	90 00	30 00	90 00
12	k	g	$\bar{3}120$	10 50	90 00	10 53	90 00
13	m′	vg	$\bar{1}010$	0 02	90 00	0 00	90 00
14	a	vg	$\bar{1}\bar{1}20$	29 58	90 00	30 00	90 00
15	m	g	$0\bar{1}10$	0 01	90 00	0 00	90 00
16	a	vg	$1\bar{2}10$	29 53	90 00	30 00	90 00
17	u	vg	$32\bar{5}1$	23 36	66 21	23 25	66 04
18	u	p	$\bar{5}321$	24 45	67 30	23 25	66 04
19	u	p	$2\bar{5}31$	22 32	66 04	23 25	66 04
20	u	p	$5\bar{2}\bar{3}1$	20 42	68 30	23 25	66 04
21	o	g	$\bar{2}201$	29 58	46 07	30 00	45 47
22	q	f	$11.5.\overline{16}.2$	12 18	50 02	12 13	50 41
23	c	vg	$02\bar{2}1$	29 58	46 18	30 00	45 47
24	p	vg	$10\bar{1}1$	0 07	27 37	0 00	27 20
25	p	vg	$\bar{1}101$	0 16	27 35	0 00	27 20
26	p	vg	$0\bar{1}11$	0 09	27 28	0 00	27 20
27	c	g	$1\bar{1}02$	29 55	14 30	30 00	14 29

[illegible]

It will be noted that the Miller-Bravais symbols used in this table are not the same as those given in the Winkeltabellen for the corresponding angles. This is due to the difference of orientation, Goldschmidt using for the tourmaline an orientation G_2 in which the crystal has been turned 30° around the vertical axis, from Dana's orientation G_1.

If ghkl and g'h'k'l' are the Miller-Bravais symbols of a certain face, respectively in the orientations G_1 and G_2, those symbols are related by the following equations:

$$g = h' - k'$$
$$h = k' - g'$$
$$k = g' - h'$$
$$l = l'$$

Example: $g'h'k'l' = 11\bar{2}0$

$$g = 1 - 2 = 3$$
$$h = 2 - 1 = 3$$
$$k = 1 - 1 = 0$$
$$l = 0$$
$$ghkl = 3300 = 1100$$

The calculated angles of Goldschmidt are based on Miller's ratio $c = 0.4477$. The tourmaline from Baffin Land has a slightly different parameter. We may calculate this from the measurements made on the terminal faces, which gave very good or good reflections, by applying the formula:

$$c = \frac{\sqrt{3}}{2} \cdot \frac{l \tan \rho}{\sqrt{g^2 + h^2 + gh}}$$

The results are indicated in the following table:

Number of the face	Letter	Reflections	Symbol	ρ	c.
17	u	vg	$32\bar{5}1$	66°21′	0.45368
21	o	g	$2\bar{2}01$	46 07	0.45023
23	o	vg	$02\bar{2}1$	46 18	0.45312
24	p	vg	$10\bar{1}1$	27 37	0.45307
25	p	vg	$\bar{1}101$	27 35	0.45243
26	p	vg	$0\bar{1}11$	27 28	0.45019
27	e	g	$1\bar{1}02$	14 30	0.44794

In order to calculate the average value of c, we omit the exceptional value found from the measurements made on face 27 and take the average of the first six values of c. This leads us to:

$$c = 0.45216$$

Such a high value of c indicates that the tourmaline from Baffin Land probably contains ferric oxide Fe_2O_3, a fact that is emphasized by the dark green color. Tourmalines containing alkalis, magnesia or ferrous iron show a vertical parameter smaller than 0.45 and their color is lighter. A chemical analysis could not be performed on account of the small dimensions of the crystal.

The correspondence between the measured angles and the calculated angles of Goldschmidt is as a whole satisfactory; nevertheless some k and u faces gave poor reflections due to natural corrosion figures. In such cases the difference between measured and calculated angles become abnormal.

I am greatly indebted to Professor T. L. Walker and Professor A. L. Parsons for valuable suggestions and assistance in many ways.

SEEDS.

By John R. Dymond, B.A., Seed Analyst,
Dept. of Agriculture, Ottawa.

Seeds may be studied from two points of view. We may study the use which plants make of seeds or the use which man makes of them. From man's point of view there are two uses for seeds (1) as food for himself and animals and (2) for the production of crops. These different points of view are not unrelated and any intelligent discussion of the subject must include a consideration of all three.

Plants are living organisms: their life, like that of all animals, is limited. Some trees live for thousands of years, other for hundreds, but most plants live for only a few years and a very large number grow up from seed, flower, mature their seed and die all in one season. Such plants are called annuals and they are common in parts of the world with severe winters like ours.

One of the uses of the seed to the plant is to preserve its kind through periods of drought, cold or other conditions that would kill the growing plant. In reality the seed is a very small plant carrying with it a supply of food material. In some ways it is comparable with a bird's egg which is packed with food material to provide for the development of the little chick until it is ready to break the shell and pick up its own living. Similarly a supply of food material is stored in the seed for the support of the little plant until it has established its roots in the soil and leaves in the air and is ready to make its own food from the elements drawn from the soil and the air.

A plant or animal is most helpless and most easily destroyed when it is young, but nature has provided that, packed away in a seed, the miniature plant is able to withstand very adverse conditions. It may be subjected for long periods to the low temperatures of winter wtihout injury and the absence of moisture which kills plants only serves to prolong the life of the seed. The ability to withstand such conditions is what makes it possible for many plants to survive in parts of the world where otherwise they would be killed by cold winters or seasons of long continued drought.

This, however, is not the only function of seeds in plant life. A single plant sometimes produces hundreds of thousands of seeds, by means of which it may produce other plants like itself over a wide area of country. Being so well fortified against injury the little plant in the seed is not nearly so easily killed as a little seedling of the same plant would be. It may be carried long distances and lie dormant for a considerable time before starting into life as a new plant. Some (e.g. thistles and dandelions) are provided with downy plumes which enable them to float in the air and to be carried about by wind. The keys of the maple and basswood serve the same purpose. Others have barbed or hooked hairs by which they attach themselves to passing animals (the various burs). Still others are produced in attractive fruits which entice birds and other animals to carry them away as food. Many seeds pass undigested through the digestive tract of animals. Seeds are aften carried long distances by the water in streams, by the wind over the top of snow, in mud attached to the feet of birds and animals and in hundreds of other ways. A plant would not spread its kind over a very wide area if it had to depend on little seedlings being distributed about.

The ability of the seed to maintain its vitality for a number of years is an important factor in the propagation of plants by seeds. It is a common experience for a farmer who has a field containing a certain kind of weed, to seed it to hay or pasture for a number of years, during which he will see few if any of the weeds, and then to plow it up and find plenty of the weeds still in his field. The plants have survived in the field in the form of seeds.

A consideration of these facts makes us realize what an important part seeds play in the plant's struggle to maintain its kind on the earth in competition with other plants and in spite of the adverse conditions which overtake it from time to time.

All plants, however, do not produce seeds. Ferns, mosses, mushrooms and many other plants are propagated by means of spores. Ages ago all plants living on the earth were reproduced by means of spores. The great forests that produced our coal were not made up of seed plants. The advantage which seed plants have over spore plants in the struggle for existence is seen in the fact that to-day seed plants are the dominant ones of the earth.

So far we have considered seeds only from the plant's point of view. Man has found them of great use to him as well. We have already seen that the mother plant stores a great deal of food material in the seed for the use of the little plant during the time it is developing its roots and leaves just as the hen's egg is stored with food for the use of the chick during its development. Just as man finds it convenient to use the food stored in the egg, so immense quantities of human food are secured from the seeds of plants. Wheat, corn, peas, beans and rice are a few of the more important seeds used as food by man.

To a farmer or a gardener seed means anything used to produce a crop. From this point of view the potato tubers put into the ground to produce a crop of potatoes are regarded as seed. In one sense all wheat is made up of the seeds of the wheat plant, but when we speak of seed wheat we mean it is to be sown for the production of a crop.

There are certain qualities which seed must have in order to produce a good crop. In the first place it must be vital, that is, the little plant in the seed must be alive and capable of starting to grow again when given the proper conditions of moisture and temperature. Although the little plant in the seed is able to withstand conditions that would kill the plant that bore it, yet certain conditions will kill it. Extreme heat or cold will injure damp seed more readily than it will seed that is dry. Heat injures seed more readily than cold. Seeds should therefore be stored in a cool, dry place. While some kinds of seed remain vital for a long time, others will live only a year or two. Seeds eighty years old are said to have produced plants, but the stories of wheat taken from the hands of Egyptian mummies, producing plants are not authentic.

Besides being careful to see that grain to be used as seed will grow, it is necessary to examine it to see that it does not contain the seeds of bad weeds. Then, too, we should know its variety. The kinds of wheat grown in Kansas are not suitable for Canadian conditions and so it is with every crop. It is necessary to choose a variety suited to the conditions under which it is to be grown. There are many other points to be taken into consideration in choosing seeds to be used to produce a crop in addition to its vitality, purity and variety.

The seed is therefore to be regarded as a device of the plant for propagating its kind. In fulfilment of this function it is packed by the mother plant with food material for the use of the little seedling. Besides using seeds for the production of crops, man uses them on account of the food material which they contain as food for himself and for his animals.

A LIST OF AMPHIBIANS AND REPTILES OF THE OTTAWA, ONTARIO, DISTRICT.

By Clyde L. Patch.

As a primary reason for publishing this list I submit the following sentence from the check list of the North American amphibians and reptiles recently published by Drs. Stejneger and Barbour: "There still is opportunity for valuable field work to determine the precise distribution of many of our most common species."

Secondarily, I wish to aid in arousing an intelligent interest in these plentiful but, owing to their secretive and nocturnal habits, seldom seen animal forms whose economic value is commonly unappreciated.

The species listed were all observed within a radius of eighteeen miles of Ottawa, Ontario, and individuals of each were collected.

Necturus maculosus—Mudpuppy.
Notophalmus v. viridescens—Common Newt, (common).
Ambystoma jeffersonianum—Jefferson Salamander, (most common).
Ambystoma maculatum—Spotted Salamander.
Plethodon cinereus—Red-backed Salamander; Dusky Salamander,—2 color phases, (dusky phase only).
Eurycea bilineata—Two-lined Salamander.
Bufo americanus—American Toad.
Pseudacris triseriata—Swamp Tree-Frog. (common).
Hyla crucifer—Spring-Peeper.
Hyla v. versicolor—Tree Toad.
Rana c. cantabrigensis—Northern Wood-Frog.
Rana catesbiana—Bullfrog.
Rana clamitans—Green Frog.
Rana palustris—Pickerel-Frog, (2 localities only).
Rana pipiens—Leopard-Frog, (most common).
Rana septentrionalis—Mink-Frog, (rare).
Storeria occipito-maculata—Red-bellied Snake.
Thamnophis s. sirtalis—Garter Snake.
Chelydra serpentina—Snapping Turtle.
Chrysemys m. marginata—Western Painted Turtle.

NOTE.—Amphibians and reptiles from any part of Canada will be greatly appreciated if sent to the writer at the Victoria Museum, Ottawa, Ont., Can.

SEPTEMBER 1918

Drawn by C. E. Johnson.

SQUIRRELS AND CHIPMUNKS IN AUTUMN.

In September, one can frequently associate some stroll a-field, with a highly indignant red-squirrel, or chipmunk, resenting intrusion in the midst of gathering his autumn spoils. A number of prettily-striped, ground-dwelling chipmunks, scampering over golden leaves, makes a pleasing picture indeed.

A scene thus enacted, which lingers long in memory, was witnessed, a few miles from the town of Haliburton, in Haliburton District, Ontario.

On a hardwood ridge, bordering a small lake, innumerable chipmunks and red-squirrels, had congregated to gather beech-nuts. Whenever the weather was fine, they were to be seen at all hours of the day, busily scampering over the fallen leaves. Blue jays ate the nuts from the tree-tops, and partridges came often to feed from the ground. A box-trap revealed the presence of the deer or white-footed mouse, which no doubt took nightly interest in the bill-of-fare. White-tailed deer also came quite frequently, in the early morning hours, to lick up the fallen nuts.

Of all these woodfolk, the chipmunks were noisiest, and of particular interest. At intervals throughout the sunny mornings and early afternoons, they would break the silence with a musical outburst, which made the woods fairly ring. This would begin by some individual uttering the familiar "chuck" in rythmical succession. Nearly every chipmunk within hearing distance, mounted stump or log, and responded in unison for several minutes. This outburst would finally subside to two or three individuals; who, failing to receive a response to prolonged "chucks", speedily fell to gathering nuts again. The approach of colder weather, accompanied by a light snowfall in the last week of October, suddenly put an end to their activities.

In Elgin county one September morning, another busy family group was observed, near the edge of a hardwood bush, cutting hickory-nuts from three trees. This group contained six squirrels; five black, and one red. The blacks sometimes came through the tree-tops, and at other times over the ground, and returned by either route. One, which descended with a nut was followed at a distance, and found to have cached five or six hickory-nuts, separately, in the seams of a partially decayed log. I do not remember distinctly whether these were hulled or not. The red-squirrel in this instance worked harmoniously with the blacks. A close watch revealed its hiding place—a hollow elm log close at hand. Within was found about a half-bushel of hickory-nuts, with hulls still on. I am inclined to believe that this was only a temporary store-room; a sort of handy hoarding place, to keep a share from falling to the blacks who had the advantage in numbers.

While watching these active occupations, a racoon emerged from a hole, high up, in an adjacent elm, to sun itself.

An instance where a red-squirrel resented the intrusion of a black-squirrel, occurred in this same bush, on a huge oak. The black-squirrel was first noticed, making its way over the ground to the butt of the tree. He quickly ascended, and, had reached the upper branches, when a wrathful red-squirrel, hitherto unnoticed, sprang to attack. Round and round the trunk they went, the black punished unmercifully. Unable to withstand so furious an onslaught, the black-squirrel rushed to the end of a branch, and, took a wild and flying leap into the next tree. Away he sped through the tree-tops, leaving the victor to hurl his contempt in characteristic red-squirrel fashion. Later he began storing acorns in a hole high up within the oak.

A few notes taken in different localities, furnish an interesting array of autumn food-stuffs.

On Mount Saint Anne, Quebec, in October, a red-squirrel was seen tucking the disk of a mushroom in the forked branch of a tree. Several up the Ottawa river last year, were busily cutting cones from the conifers, in the last week of September. A red-squirrel near St. Thomas, Ontario, had stored a butternut crop within the hollow trunk of the tree which bore them, and a white-footed mouse, in the same locality, had a tiny store of American linden or basswood seeds, under a log, beneath a brush-pile.

C. E. Johnson, Ottawa.

NOTES AND OBSERVATIONS.

Additions to the Odonata of the Ottawa District.—When, in 1908, Dr. E. M. Walker published his paper on the Odonata of the Ottawa district,* he remarked that further investigation would no doubt add other species to the list he was publishing. Indeed, the material he had used for his work had not been the result of systematic collecting, but had been taken largely by entomologists when hunting for insects of other orders.

At Dr. F. Ris's request I paid special attention to the Odonata, and though my collecting was mostly done during holidays I obtained a fairly good number of species, namely 41, amongst which are 12 which are additions to the Ottawa fauna. All the captures were made in the immediate neighborhood of St. Alexander's College, Ironside, Que., which is less than five miles distance from Ottawa.

Another interesting result was the addition of a few records to the fauna of Quebec, namely: *Gomphus spicatus* Hag. and *Libellula luctuosa* Burm.—*Cordulegaster obliquus* Say, *Hagenius brevistylus* Selys and *Boyeria grafiana* Williams, are for the first time definitively recorded from that province, while *Ophiogomphus anomalus* Harv. has not yet been mentioned for Canada, though Dr. E. M. Walker has seen in the Carnegie Museum, Pittsburg, specimens from Lake Nipigon, Ont.† The entire list being of more interest for Quebec, is to be published shortly in the *Naturaliste Canadien*. The additions to the Ottawa fauna are as follows:—

1—*Enallagma antennatum* Say.
2—*Enallagma carunculatum* Morse.
3—*Coenagrion resolutum* Hagen.
4—*Cordulegaster maculatus* Selys.
5—*Cordulegaster obliquus* Say.
6—*Hagenius brevistylus* Selys.
7—*Ophiogomphus anomalus* Harvey.
8—*Gomphus spicatus* Hagen.
9—*Aeshna canadensis* Walker.
10—*Aeshna interupta* Walker.
11—*Aeshna umbrosa* Walker.
12—*Tetragoneura cynosura simulans* Muttowski.

L. M. Stohr, St. Alexander's College,
Ironside, P.Q.

One of Nature's Wonders.—One evening we were sitting on Bon-fire rock, and watching the children at play. All were happy with sail-boats except one little girl, who was watching something on the shore very intently. Jumping up suddenly she came running up to us, calling out in amazement: "Come everybody and see two sticks walking together!"

As we could not resist her eagerness we followed her back indulgently. Following the little pointing finger we too, saw, with no little surprise, two small twigs, evidently fastened together, slowly moving.

Then we turned to our naturalist.

Carefully he explained to both big folks and little folks, that the caddis-fly in its early stage had made itself cosy and secure in a little sack, partly under and partly between, those two little twigs, fastening all firmly together by a secretion stored within itself for that purpose. Then he suggested that the finder, Elsie, should put it in water in a glass jar and watch it closely for a few days to see what would happen. She did not have to watch long, for the next afternoon she called everybody again, exclaiming that something was certainly happening to her specimen. The whole household hurried to the scene. Out between the twigs was emerging a little form, all wrapped in a dainty casing. Then out of this came the adult caddis-fly, which after a few struggles and a few restings, fluttered around the room and then flew gayly out of the window.

M. E. C.

Bide-a-Wee Island,
Upper Blue Sea Lake, Que.
July 31st, 1918.

The Effect of Gopher Poison on Grouse.—Too often tradition passes current as fact and "what everybody says" is many times accepted without examination or verification, especially when it agrees with conceptions of personal interest. An interesting example of the care that should be used in accepting or acting upon popular report or opinion is given in the report of the Game Branch in the *Public Service Bulletin*, Vol. VI, No. 12, July, 1918, pp. 208-9, published by the Saskatchewan Department of Agriculture.

In this report it appears that the marked scarcity of "Prairie Chicken" (Sharp-tailed Grouse, *Pedioecetes phasianellus*) throughout the Prairie Provinces was almost universally attributed by sportsmen and others to the extensive use of strychnine in gopher poisoning. On experimenting with live birds, however, it was discovered that they have such remarkable resistance to this poison that it can no longer be blamed for their destruction.

Two captive "Prairie Chicken" were used for this purpose. Upon the first day these were each fed, in four meals of from 5 to 350 grains each, a total of 1550 grains of wheat poisoned with the usual gopher formula. The next day they were given an unmeasured amount, but all and more than they would eat. The third day, by forced feeding, they were each made to consume 2100 such grains. No ill-effects resulted to either individual. The same grain proved fatal to gophers on the consumption of 15 grains. Thus each bird had in one day eaten enough active poison to kill 140 gophers without perceptibly harmful results.

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*Ott. Nat., Vol. XXII, pp. 16, 49.

†Dr. Walker has kindly permitted me to use this note here.

The formula used was:—

Whole wheat	20 lbs.
Strychnine sulphate	½ oz.
Molasses	1 pt.

Though grouse thus seem practically immune to strychnine, we know that many other species of birds are quite susceptible to it. Seed-eating song birds, Mourning Doves, and even geese are readily poisoned by it, and the greatest care should be used in its distribution. Mr. David Lantz, of the U. S. Biological Survey, remarks that clear grain scattered in the vicinity of water does much to attract and keep birds away from poisoned areas.

It is not necessary, nor at this time, expedient, to use wheat for poisoning purposes. Other grains such as oats, are less attractive to many species of birds, but are quite as effective against gophers. In some of the work of the U.S. Biological Survey in developing control methods against rodents, it was found that where oats were used as a medium for poisoning no Mourning Doves were killed, but on accidental introduction of a small amount of wheat in the mixture, they were poisoned in numbers and dissection showed that they had picked out the wheat while rejecting the other grain.

The use of a cheaper and less valuable grain for this purpose is also to be recommended for other reasons in these days of food stringency. At all times, however, the poison should be used with discretion and care. Small lots of poisoned grain placed at strategic points, such as near or in the mouths of burrows, is quite if not more effective against gophers than is its use in more wide-spread and wasteful manner, and is more economical in material and valuable domestic and wild life.

P. A. TAVERNER.

Ottawa, Sept. 27, 1918.

Diving Habit of the Spotted Sandpiper.

While on a canoeing trip down the beautiful Restigouche river, in September, Mr. M. B. Dunn and the writer were one morning greatly surprised at the unusual behaviour of a Spotted Sandpiper (*Actitis macularia* Linn.) Our canoe was gliding noiselessly down stream in smooth water about two feet deep and a little sandpiper was skimming over the water ahead of us. It was as peaceful a scene as anyone could wish. Suddenly there was a splash and our little friend had submerged headfirst into the water. In hot pursuit was a hungry pigeon hawk (*Falco columbarius columbarius*) but the dive had saved our comparatively slow-flying little friend. When the sandpiper came up a few feet away from the scene of his hurried dive, the hawk made another swoop at him, but once again and without the least hesitation the little bird went headfirst into the water. Twice baulked by an animated breakfast the hawk gave up the chase, and the day was saved for our little friend.

On the Restigouche these active little hawks are very abundant and undoubtedly exact a heavy toll from the small birds. The Spotted Sandpiper remains abundant, however, and seems to owe its safety to the rather unusual habit of diving.

JOHN D. TOTHILL.

E. H. Forbush, State Ornithologist of the Commonwealth of Massachusetts, is developing a new field of usefulness for his office in the study of bird migration. He gathers current migrational reports from a large list of correspondents and observers throughout New England and adjoining parts of Canada, correlates them and issues mimeographed bulletins to those specially interested. By this means interested investigators have their attention called to passing phenomena while pertinent evidence is fresh in mind and often in time to make additional observations on them while they are still in progress. Bulletin IX, Sept. 16, indicates that there has been a decided decrease in the number of breeding warblers over a large area of New England the past season, certain swamps have been deserted by the Red-winged Blackbirds; Whip-poor-wills have almost disappeared from some localities; Tanagers decreased locally, and House Wrens considerably reduced in number. It would be interesting to see how far these conditions extend and if possible find some explanation for them.

This sample of team work organized and directed by the state is a good example to other public institutions and doubtless will produce important results.

P. A. TAVERNER.

Note on the Burrowing Habit of Frogs.—

In June, 1908, while working in the western part of Kansas, I had the opportunity of observing some habits of the Leopard Frog. This particular section is in the semi-arid belt and often, for three or four years at a time, there is not enough rain to thoroughly soak the ground. During these dry periods there is not a frog to be seen except near living water.

At the time above mentioned there had been a prolonged rainy spell and the ground was thoroughly soaked. The frogs appeared in such great numbers, all over the prairie, that one could not drive without running over them. A few days later the rains ceased, and, as the ground began to dry, the frogs disappeared, not to be seen again, at least not in such great numbers, until another wet spell.

At another time, in the eastern part of Wyoming, I had dug one hundred or more post holes about a foot deep, the ground being too dry and hard to dig deeper, when a prolonged rainy spell thoroughly soaked the ground and frogs and toads appeared in great numbers. After the rain ceased, I dug the holes deeper and in the bottom of every hole from two to four frogs and toads had burrowed down as far as the ground had been softened by the rains.

I have often wondered how long frogs can lie dormant or hibernate and if they really remain in this condition between wet seasons, which, in the region referred to, are sometimes several years apart.

Because so many frogs appear during rainy weather and disappear again as the ground gets dry, may be one reason why some people think that frogs rain down.

C. M. STERNBERG.

THE NIGHT HERON AT LONDON, ONT.—On the morning of August 10, 1918, while paddling round the pond, we flushed from the edge, a bird which we took at first glance to be a common bittern, some of which were found almost every morning. Ten minutes later, when the light was that much better, we flushed it again and saw that it was a Night Heron, Black-crowned, of course. To make certain, the bird lit in a tree in plain view and remained for inspection for some minutes. The next morning we had a view that was even better, and saw that the iris was a brilliant orange-red. While flying over the pond, if a Blackbird or Kingbird interfered with it in the least, it gave one of its characteristic notes, which is nearly represented by the syllable *Quah*.

These birds nest in the St. Lawrence valley, and near Ottawa, and in Manitoba, but they are excessively rare in western Ontario. Possibly there is a nesting ground somewhere in the province, but it has not yet been located.

W. E. SAUNDERS, LONDON, ONT.

BOOK NOTICES.

OUR TREES: HOW TO KNOW THEM. By Arthur I. Emerson and Clarence M. Weed. New enlarged edition: Philadelphia and London; J. B. Lippincott Company, 1918.

The new edition (octavo) of this well known work on the trees of North America, is indeed an excellent publication. It is a volume of 295 pages, the type and general get-up being very attractive. The illustrations are very fine and are from photographs taken direct from nature. They have been brought together in such a way that the non-botanical reader can recognize at a glance either the whole tree, or the leaves, flowers, fruits or winter twigs, and thus be able to identify with ease and certainty any unknown tree to which his attention may be called. A single page, in each case, is devoted to a discussion of each tree, opposite to which is given the illustration of the tree or portions thereof. The distingusihing characteristics of the various species are given as well as the more interesting phases of the yearly cycle of each and the special value of each for ornamental planting. Notes on distribution are also included. In all there are 149 illustrations. The price of the volume is $3.50.

BILLY THE BOY NATURALIST. By William Alphonso Murrill.

This interesting book of 252 pages, with 43 illustrations, is a kind of memory ramble taken through the woods for recreation, and is of special interest to children, as it is a true record of how one boy lived. Teachers of nature study will find in it much of interest to read to the children, and to grown-ups it will bring back memories of their own childhood days.

It is an attractively gotten up little volume, printed in such simple language that a child can readily read and understand. The 43 illustrations are all from photographs and illustrate points brought out in the text. The book is published and for sale by the author, whose address is Bronxwood Park, New York City. The price is $1.50

Murrill's and Saccardo's Names of Polypores Compared. By W. A. Murrill, Assistant Director of the New York Botnical Garden. New York, published by the author, 1918.

The object of this pamphlet of 31 pages is to harmonize the names used by Saccardo and the author for the species of polypores and boletes. Some herbaria use one system of nomenclature and some the other. By consulting this pamphlet one can readily obtain the equivalent of any recognized name in either system. Collectors will also find the pamphlet useful as a check list. The price of the publication is 35 cents

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The Peace River District, Canada; its Resources and Opportunities. By F. H. Kitto, Natural Resources Intelligence Branch, Department of the Interior, Ottawa, Canada.

This report of 47 pages has recently come to hand. It contains interesting information with regard to climate, soil, agriculture, minerals, game, water powers, transportation and education. A map of the district showing general topography accompanies the report.

In the *Canadian Alpine Journal*,[*] appear three articles of interest to Canadian naturalists. They consist of brief reports on the work done by the Geological Survey of Canada in Jasper Park, Alta., during the summer of 1917, and are in the nature of additions to lists previously published[†] by Standley, Hollister and Riley on the adjoining and Mt. Robson regions. Jasper Park was the scene of some very early collecting and is the type locality for many now well-known species, hence it is of more than passing interest to the naturalist. No visitor to the Park should fail to provide himself with these lists.

The Flora of Jasper Park, Alberta. By J. M. Macoun, pp. 54-61. This is a readable description of the floral conditions surrounding Jasper Station and Mt. Edith Cavell and a generalized account of the species observed. It is of sentimental interest to note that the writer gives a new vernacular name to the Silky Everlasting, *Antennaria media*, calling it in memory of the martyred nurse, the Cavell Everlasting.

Addenda to the Birds of Jasper Park, Alberta. By P. A. Taverner, pp. 62-69. This contains a short statement of the field work upon which the article is based, followed by an annotated list of species continuing Riley's list from 79 to 108, thus adding thirty species to it besides further notes on nine species already treated by him. The annotations are mostly of a technical nature discussing the supspecific status of the specimens considered.

Some Notes on the Mammals of Jasper Park, Alberta. By R. M. Anderson, pp. 70-73. This consists of annotations on twenty species of mammals. They are mostly of a technical nature describing the specimens examined, but the collector, Wm. Spreadborough, is freely quoted as to abundance and distribution in the Park.

In the *Condor*, Vol. XX, No. 5, September-October, 1918, are several articles of Canadian interest:—

Some Oceanic Birds from off the Coast of Washington and Vancouver Island. By Stanton Warburton, Jr., pp. 178-180. This is an account of a week's trip, June 26-July 3, 1917, to the waters described in the title. It records the occurrence of Tufted Puffin, California Murre, Sooty and Pink-footed Shearwaters, Skua, and Black-footed Albatross. Specimens of most of these were taken and the records placed on firm basis. Whilst the Pink-footed Shearwater does not appear to have been taken within Canadian waters the locality is close enough to be of special interest to Canadian ornithologists.

Some Birds of Alert Bay, British Columbia. By P. A. Taverner, pp. 183-186. This contains a general description of the locality and the conditions under which a week's visit was made to Alert Bay in midsummer, 1917. This is followed by an annotated list of 40 species of birds identified or collected. The annotations discuss plumage sequence, subspecific status and includes some life-history data.

The same author in a short note, p. 187, under head of "Heerman Gull and White Primary Coverts," records an abnormally marked bird from Alert Bay, B.C., similar to those described and figured by Mr. George Willet in the May-June *Condor* of the current year.

The *Ibis*, VI, July 1918, pp. 477-496, contains a bird list of special interest to Prairie ornithologists. Article XXIV, Further Notes on Birds Observed at Alix, Buffalo Lake and Red Deer, in the Province of Alberta, Canada, in 1915-1916. By Chas. B. Horsbrough, Canadian Army Medical Corps, C.E.F. These notes are additional to a similar paper (*Ibis*, 1915, pp. 670-689) and include extensive annotations on 96 species, containing some important records and a large amount of life-history, distributional and migration data.

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[*] The Canadian Alpine Journal, Vol. IX, 1918, published by the Alpine Club of Canada, price $1.50, from the Sec.-Treas., S. H. Mitchell, Sidney, Vancouver I., B.C.

[†] Ibid, Special number, 1912.

THE OTTAWA NATURALIST

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ESKIMO FOOD—HOW IT TASTES TO A WHITE MAN.*

By Rudolph Martin Anderson, Zoologist, Biological Division,
Geological Survey, Ottawa.

How the food of the Eskimo, or, indeed, the food of any race, tribe, or people, tastes, depends largely upon the taste, the natural or acquired habits, or most important of all, the appetite at meal-time. The old proverb that "hunger is the best sauce," loses none of its force in Eskimo-land. Having in my time sampled most of the numerous varieties of Eskimo foods,** sometimes for reasons of diplomacy and sometimes out of politeness to kind hosts, and at other times from a scientific curiosity to test the palatability and food value of them all, I have occasionally thought myself qualified as a northern food expert. Some foods I have considered delicacies on the wilderness trail, but later, when trying the same articles at a well-stocked house or ship, the salt seemed somehow to have "lost its savour," and I came to doubt my competence as an unprejudiced witness.

The palatability and delectability of foods, and probably to a certain extent their digestibility, must be judged in connection with the circumstances under which they are consumed. As an example, after accepting the Eskimo dictum that the large Snowy Owl of the north is an excellent game bird, proven by experience to be almost invariably fat, and with clean, white meat more like that of the domestic fowl than any other Arctic bird, and having one served for a morning short order in a white man's camp, we have been obliged to admit that "boiled owl," except for travellers with exceptionally strong teeth and powerful jaws, is not to be recommended as a breakfast food. The prolonged boiling required for an aged owl makes the bird more suitable for an afternoon tea or a supper dish. However, I never knew anybody who had tried the Snowy Owl to complain of any ill flavour.

What does the Eskimo eat? The home of the Eskimo is beyond the limits of the cultivation of vegetable foods, and consequently in his native state, he is by compulsion very largely a meat and fish-eater. Normally he eats but a few of the watery, rather tasteless Arctic berries (cloudberries, crowberries, alpine bearberries, and occasionally blueberries and cranberries), digs an occasional mess of stringy wild roots, or plucks a few succulent green leaves of sorrel or scurvy-grass. Meat or fish comprise the standard menu. The Eskimo will eat practically anything that walks, flys, or swims (unless there is some local taboo on a particular species or part of an animal), and the food-list embraces a pretty comprehensive list of the fauna of the region. He may be called an all-around practical naturalist or economic biologist.

The Eskimo as a rule lives well, and though seldom corpulent, as a rule is a robust, plump, and well-nourished individual. He knows nothing of the icy terrors of the frozen North—his country is more bounteously supplied with food than the inland wooded country for hundreds of miles to the southward. The Eskimo gets most of the game animals and fish that the northern Indian gets, and in addition to these, has the seals nearly everywhere (and in some parts walrus and whales) to supply in sufficient abundance the blubber and oil, the fatty, heat-producing elements which every one craves in some form in a cold climate, and for which the northern Indian is usually "starving." In these meatless, wheatless, and other kinds of food conservation days, an Eskimo feast of fat, crackly brown caribou ribs roasted, a stew of mountain sheep mutton, or sweet, juicy, boiled caribou tongues, briskets, or hearts, tenderloin or "back-sinew meat" steaks, or even fried seal livers, are not unpleasant things to recall to memory. As Sir George Back wrote of Indian cookery on one of his extended overland winter trips, good moose meat can hardly be spoiled by any cook's treatment, and the same applies to many other kinds of game as well.

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*Published by permission of the Director of the Geological Survey of Canada

**Western Eskimo, from Bering Strait, Alaska, to Bathurst Inlet, N.W.T.

The Eskimo, even less than the white man, dislikes to be rationed, and when he has plenty of food likes to eat heartily, without worrying about a problematical shortage later on. Sometimes he may have to feed caribou-skin robes and sleeping skins to his dogs, or even eat them himself, but a period of shortage usually comes to an end somehow. Native "tanned" skins, merely broken and scraped soft, when boiled soft and tender, probably contain as much nutriment as an equal weight of meat or the gelatinous attachments of the ordinary well-boiled soup-bone, and eating boots or boot-material is not really as bad as it sounds.

a week, than those with a limited choice of food. When one expects whitefish (or caribou) as the *piece de resistance*, or perhaps the whole meal, three or four times a day, it does not usually occur to him to quarrel with it any more than with the thrice daily bread of civilization "The full soul loatheth an honeycomb; but to the hungry soul every bitter thing is sweet."

If the party is large and the pots are small, the meals are often supplemented, prefaced, or finished with a few strips of sun-dried or smoke-dried meat, a side of ribs or a flat shoulder-blade set up to roast beside the coals, and the long marrow-bones cracked for dessert. Sometimes the marrow-bones are roasted, but not often, for to the Eskimo cooking a marrow-bone is like "painting the lily or gilding the rose." In winter a piece of frozen raw meat very often forms a part of the meal.

Barren Ground Caribou; near Hood River, N.W.T.

On the land, the most important food animal in most districts is the caribou. In a deer-camp there is apt to be little food but caribou-meat (*"tuk-tu"*), as all energies are devoted to the caribou chase. Boiling is the most general way of cooking meat, the easiest manner of preparing large quantities, cooked in a fairly uniform and thorough manner, and if you are finicky enough to insist upon it, probably the cleanest way of preparing meat in a native camp. Where meat and fish "straight" (i.e., without other foods) form the steady diet, most people find boiling the least monotonous style of cooking. In this connection, it seems that people with the greatest variety of food to choose from, are more apt to say they are "tired" of a certain article, let us say prunes three times a week or beans twice

When the caribou are fat in the late summer and early fall, and the hunters roam over the so-called "Barren Grounds," while the early frosts are tinting the bearberry leaves scarlet, the dwarf willows lemon yellow, and the blueberry leaves purple, and the keen pure air whets the appetite of the heavy-laden packer, the open fire at night and the feasts of juicy caribou-meat that properly go with it, are attractions not to be despised.

On hunting trips, either summer or winter, the Eskimo, expecting to move shortly, tries to get rid of the waste as quickly as possible, using the bulky and bony parts of the animal first. When hunting for ships or white men in general, the natives usually save the saddle (i.e., the pelvis with two hams attached), which parts are more suitable for steaks or for roasting in an oven. For themselves, the hams are either fed to the dogs, which must have their share, or cut up for drying. The white man's "choice cuts" are not the Eskimo's or the Indian's favorites, and as a rule are not the first choice of the out-door man who is cooking in the field with primitive appliances.

The caribou (or sheep) heads are cooked very early in the game—split, quartered and boiled with the brains in place, or roasted suspended on a rotating string before the fire. The long leg bones are cracked for their long sticks of sweet marrow (which tastes much like unsalted butter); the ribs, while not carrying very much flesh, are boiled or roasted, and when fat are a luxury; the neck and backbone are boiled, the latter after the long, thick slabs of "back-sinew" meat are removed to make sewing thread, and the tender, stringless meat which remains is fried, frozen solid for eating raw, or dried to make "pounded meat" or pemmican. The solid meat of hams or shoulders is cut up into strips for drying, or in cool weather is cached entire.

In skinning the caribou the back-fat is removed in a great slab (sometimes weighing 40 to 50 pounds) and the kidney and mesenteric fat removed in masses, it being considered the most precious part of the animal. The back-fat of the bull caribou, which may be as much as three inches thick in the fall, may be kept through the winter and sliced up and used for practically all purposes where bacon is useful. Personally I prefer it to bacon.

Under normal conditions, when not spoiled by civilization or market-hunting for white men, the Eskimo methods of hunting and handling food animals would delight the hearts of a Food Conservation board, for practically nothing is wasted. The skin of the caribou is highly prized, and is saved for clothing and bedding. In the field the paunch or stomach is made into a little bag, and the blood saved to thicken the bouillon when the meat is boiled, the sledge-dogs and pack-dogs are fed the offal, and of the remainder of the carcass, little is unused for food except the hoofs. Even the young antlers, when in the "velvet" are eaten after removing the soft skin. In my opinion the conservation methods are carried a trifle too far when they pick out the large grubs of the warble-fly from the skin of the caribou in the spring, and eat them like cherries. The grubs are very watery and absolutely tasteless, but for some reason the Eskimo seems to relish them.

Whenever possible the bones, cast aside after the boiled meat has been scraped or cut off, are saved until a large pile is accumulated. When a sufficiently large pile is collected, or two or three days before camp is to be moved, a heavy stone hammer is made by lashing a handle to a rock of suitable shape and size, and the women of the camp break up all the bones into small fragments—the vertebrae, ends and joints of the long bones, ribs, and tarsals, metatarsals, carpals, and metacarpals. These bone fragments are placed in a large pot over an open fire, and slowly boiled, stirred, and the grease skimmed off the top, poured into kettles, allowed to harden, and kept in blocks. This bone grease (puinyirk) forms a pure white, hard tallow. The North Alaskan and Mackenzie Eskimo claim that the bones of seven caribou will yield enough tallow to fill one caribou-paunch bag, possibly 25 to 30 pounds. The war-time conservation of grease from stripped and discarded bones is not an entirely new idea of "Teutonic efficiency."

The Eskimo domestic economy is directed rather to utilizing everything, rather than stinting or economizing in amount used. Nothing can be worse than being called stingy, and the best form is to eat everything cooked or set forth for a meal, and when food is plenty meals are not very far apart. The first winter I spent with the Eskimo, I still held an old prejudice, the idea that three meals a day at stated times, were enough for a normal adult under any conditions. On Sundays and stormy days in camp, the Eskimo delighted in eating half a dozen times or more. My refusal to join in all of these fixed and movable feasts caused genuine concern to my good-hearted guide and interpreter. His dietetic theory, which he followed religiously, was this: " 'Spose we got plenty grub, more better you plenty eat. You plenty eat, bimeby you plenty fat. Maybe winter time, not too much grub, you no fat, plenty hungry, quick mukki (die)." Not being trained to this method of sub-cutaneous hoarding of fats, I was not always able to put away my full share, although as the winter wore on, my aptitude at meals seemed to improve.

The Eskimo is popularly supposed to gorge tremendously, but except in a few individual cases, his enormous eating capacity is more apparent than real. Any man, red, white, or brown, living on meat or fish "straight" will consume a much greater weight and bulk than one living on a mixed civilized diet, a more properly balanced ration. An average soldier's ration is not much over 3½ pounds daily (approximately one pound of meat, one of bread, and the other pound and a half vegetables, beans, sugar, etc.) The Hudson Bay Company's ration for a labourer on straight meat was eight or ten pounds per day. Sir John Franklin speaks of his men suffering hardship on account of short rations at Fort Enterprise with only five pounds of fresh meat (caribou or moose) per day per man.

The average white man doing the same kind of work as an Eskimo under the same conditions will eat about the same amount, grease included. The white man starting on straight meat or fish will not eat as much for the first few days, and does not crave as much. Presumably the human system for some of the elements draws on the reserves stored up in the body. Later, he has to eat much greater quantities of meat or fish to supply the proper amount of those elements which are found in but small amounts in meat and fish.

The Eskimo is naturally gregarious, and particularly in his eating habits, prefers to practice a limited form of communism. Individuals may lay up food stores, and feel a just pride in having food in plenty to set before their friends and guests from afar, and a man's social standing is largely dependent upon his ability as a hunter and his consequent ability to give more. The native "gentleman of the old school" finds his highest delight in seeing his friends eat at his table, or rather dine on the floor of his iglu or tupek, and in camps where food is abundant life seems to be one continual round of eating.

Eskimo skinning a Bearded Seal, Erignathus barbatus: Franklin Bay, N.W.T.

Taking Herschel Island in summer as an example, we find large numbers of families camped on the beach waiting for the trading ships, and in the meantime living largely on fish from their nets. The consumption of food in almost continuous communistic feasting appears on the face of things to be prodigious. Eating is irregular as to hours, but every housewife is supposed to boil a kettleful of fish, a mess of seal-meat, or a few old-squaws or eider-ducks every few hours, and generally also a pot of tea. When the meal is ready, some member of the family sings out "Niakokseragut!" and everyone within hearing flocks over with teacup in hand. Indeed, the watchful and forehanded ones begin to gather as soon as the smoke of the cooking-fire has been ascending about the proper length of time. With twenty or thirty persons sitting down in the circle, the average cooking-pot can only supply a very small "war-time portion" of fish to each person A cup of tea is drunk, a pipe smoked, and the crowds drift away, to spend a short time mending fish-nets, or working at some handiwork before the shout goes up to go somewhere else for another little snack. My experience at this sort of life was that one hardly ever got enough to eat at the meals, and had to splice out with an occasional half-dried fish from the drying-racks or stages.

The Eskimo of story is often pictured as eating tallow candles and guzzling seal-oil. These stories may be true, but in the course of several years among the Eskimos I saw but one Eskimo drink seal-oil, and that was only a small amount after several months on a very short ration of fat. The Eskimo likes to dip a piece of dry lean meat or fish into seal-oil or whale-oil, and pour a little oil over roots or berries. Sometimes he eats a piece of blubber. White men as a rule take their portion of fatty food in other ways. The Eskimo uses little fat in cookery, while the white man fries much of his meat, flapjacks, and eggs, consumes much bacon and butter, uses fat for shortening cakes and pastry, and any housewife knows what an amount of lard-oil of the hog is used in cooking a panful of luscious doughnuts. The Eskimo with his seal-oil on dry-fish or berries, and the civilized man with a taste for butter on bread or rich oily cream of the cow on his strawberries, are both following out the same fundamental principles of human diet.

People as a rule are prone to consider the food, clothing, and social customs of foreigners or outlanders as "outlandish." Many Eskimos like to eat their fish rather "high," and in many cases are practically compelled to, as in cases where the main fishery is made shortly before the freeze-up, too late in the season for drying, and too early to freeze them at once. Such fish are usually eaten after freezing hard, and the tainted odour or flavour is barely perceptible if eaten frozen. From the Eskimo standpoint the fish is really improved, as the flesh is more flaky and tender than when absolutely fresh. Some white people allow game to hang for some time for the same reason. An Eskimo who had served on whaling ships and was familiar with the odouriferous Limberger and other varieties of cheese, once said me: White man plenty eat *tipi* (rotten, stinking) cheese; what's the matter him no eat tipi fish?"

Eskimo's fish-drying place, Fishing Lake, Dolphin and Union Strait.

The primitive Eskimo, so far as I know, never used salt as an article of food, and indeed with a carnivorous diet, salt does not seem to be necessary. I have gone for several months without having any salt, and never suffered any inconvenience, although I never got beyond a certain desire for it when I happened to think about it. When living on cereals. flour, rice, oatmeal, cornmeal, etc., much more salt seems to be necessary, and the civilized Eskimo wants it as much as the white man does. The carnivorous animals do not care for salt, while the herbivores go long distances to the coast or to salt-licks.

In the winter time the Eskimo living on the sea-coast certainly gets a goodly amount of salt into his system from the melted snow and ice-water he drinks. The salt slush which forms on top of sea ice in the fall freezes as the cold increases and the sweeping blizzards of winter drift this salty snow over the land, so that snow from some distance inland will often have a perceptibly salty taste. Probably seal-meat may contain a certain amount of salt, and undoubtedly absorbs a little in the cookery, as all flesh meat absorbs salt when there is salt in the water. Salt water fish, on the other hand, may be boiled in briny sea-water, without absorbing any noticeable taste of salt.

In the fall, after the caribou have been grazing along the sea-coast, or licking the ground at salt-licks or alkaline spots inland, the meat has a noticeable salty flavour. Different parts of the animal seem to differ strikingly in saltiness. The lower joints of the legs when boiled in water, impart a strong beef-tea or bouillon flavour, and as practically demonstrated to me by a Great Bear Indian, when fresh deer-legs were boiled for supper, and more of the same kind of fresh meat boiled in the same liquid for breakfast, the resulting bouillon was almost too salty to drink. So the straight caribou-eater does not suffer from lack of salt. Indeed, when very much salt is used with the meat diet, a feeling of discomfort is felt after eating heartily of salted fresh meat, probably due to the salt sterilizing and retarding the digestive ferments.

The Eskimo eats about the same birds that the white man does, as the water-fowl all migrate to more temperate climes in winter. The geese and ducks are the most important, and are familiar to the white man's palate. The sea-ducks, eiders, auks, murres, and puffins of the western Arctic, are apt to have a more or less fishy taste, but on the whole, most birds are edible. None but the larger birds are hunted to any extent, though the small boys practicing archery occasionally knock over a longspur or a snow bunting, or a tiny shore bird, which go into the pot indiscriminately to gratify the pride of the juvenile hunter rather than as any great contribution to the food supply. The Eskimo cook usually boils birds, this being the most satisfactory method of treating sea-birds. Their custom of removing the entrails and boiling them in the pot with the rest of the bird is not inviting to a fastidious appetite, although I have been gravely informed by a sophisticated native that it is "all the same macaroni." Ptarmigan in general are grateful to the civilized taste, but a delicacy that is not so attractive is a ptarmigan intestine filled with bitter young willow buds, dropped for a minute into boiling water till it swells up like a wienerwurst, and eaten hot. The Arctic "salad," which seems to be favoured more in winter, when no vegetable food has been seen for months, is the first stomach or rumen of the caribou when it happens to be filled with freshly-chewed reindeer-moss or *Cladonia* lichens. This is frozen whole and sliced off very thin, the gastric juice supplying the acid, and a liberal mixture of seal-oil the salad dressing. The caribou stomach is seldom eaten except when filled with the succulent reindeer-moss, and when it contains woody grass-fibre is usually discarded. This food may properly be classed as "pre-digested," and under certain extenuating circumstances, such as a trail appetite, a long siege of one-course rations of meat, anything "different" may have some attractions, but few white men venture to experiment with it. The two almost omnipresent species—*Pediculus capitis* and *P. vesimenti* (the *Komuk* of the Eskimo or "cootie" of current literature) are very commonly eaten, not so much for flavour or food value, I imagine, as a convenient means of disposing of these elusive parasites.

The fish of the Arctic are not very many in number of species, but are numerous as to individuals, and practically all of them are good, well-flavoured, and of firm flesh like most fish of cold waters,—various species of whitefish, salmon trout, lake trout, pike, grayling, herring, smelt, loche, connies, etc. As long as the fish are fresh, it matters little whether they are boiled, or spitted on a stick and roasted before the fire. Most Eskimos, however, will persist in boiling fish with the scales on, which makes eating rather unpleasant. Many are eaten sun-dried or smoked, without salting, and if dried quickly in suitable weather, are very good.

One thing which surprised me was the extensive eating of raw, frozen fish, and still more, how quickly the habit is picked up. I have never been able to endure a cooked fish unless it is well done, without a trace of rawness, but I ate my first piece of raw, frozen fish with relish, and thought that they generally tasted like raw oysters, and fully as palatable.

The frozen fish, like sticks of stovewood, are brought into the warm house just long enough to soften the skin, then the skin is cut around the gills, and down the middle of the back, a corner loosened and the skin ripped off by a simple pull. The flesh is then cut away in chunks of "eating size," or eaten like corn on the cob, the skeletal portion of the fish being thrown away like the corn-cob. For an out-door lunch on a cold winter day, a frozen fish does not appeal to me—I always felt chilled inside and outside for an hour afterward. Frozen fish-roe is also relished by the Eskimo, and is very nourishing: the Eskimo say it "makes you warm inside." Seal or whale-oil is eaten with frozen fish as preferred, but fall "connies" or salmon-bellies are rich enough without.

In many parts of the Eskimo country, the seals form almost as important a part of the food supply as the caribou. West of the Mackenzie, seal-hunting is not quite as important as formerly, but seals are still hunted for skins to make water-boots and other footgear everywhere. Among the Copper Eskimo, from Dolphin and Union Straits and eastward, the seal is still more important, and practically the whole population eat little else from the first of December until May, during which period the people move out on the ice and live in snow-houses on the sealing grounds. In spite of the scarcity of fuel, the seal-meat is usually eaten cooked, boiled in stone pots over blubber-lamps, for fortunately the seal has such an abundance of blubber that there is plenty to cook the meat as well as heat the habitations fairly comfortably. Indeed, in many winter sealing camps more blubber is brought in than can be used in proportion to the meat from the chase, and large slabs are thrown away. Towards spring, the surplus blubber is saved, and preserved in seal-skin bags for the next autumn.

Seal-meat contains a great deal of blood, and has a very dark colour, and the older animals generally have a rather fishy taste, so that very few white men acquire a real liking for it, at least enough to eat it when there is any other kind of meat around. The young seals have tender meat with scarcely any ill flavour, and the liver of most seals is very fine, equal to the best calves' liver, but occasionally an old specimen of the common Rough Seal *(Phoca hispida)* has such a strong, pungent odour, as if soaked in coal-oil or gasoline, that even an Eskimo dislikes to eat it.

I think that most Eskimos at heart prefer their own native foods, although they like to have certain white man's foods in the house and on their tables, to show that they are as high-toned as other folks. Some things, like tea, and sugar when possible, they like to have, but even when plentifully supplied with "outside" rations, they like to get a chance at a meal of raw fish, muktok (whale "blackskin"), seal-meat, or boiled fish-heads. And I must confess that prepared under the limitations of the Eskimo household, without good stoves or baking ovens, in comparison with badly-cooked baking-powder bread, half-baked beans, and salt beef or pork of the usual Arctic Ocean trade quality, that the "aipanni" (old-time) rations and methods were not so bad after all.

Coming back to our text, we can say that a white person looking over the Eskimo menu, fresh from the infinite variety of civilization with articles of food from all lands, or even from the comparatively slender choice of ship's grub, would probably consider the Eskimo as poverty-stricken and starving on his limited stock of food units. Some might even go so far as to consider his meals repulsive or degrading,—our own fathers and grandfathers not being accustomed to eating seal and whale, for geographical reasons, or certain other animals from ancient tradition. The savage, however, not having been informed of his own sad and pitiful state, or not comprehending it, lives on in greasy and happy abundance for the most part.

Contentment with our food and surroundings is largely a matter of temperament and digestion. The unspoiled savage is usually blessed with an equable temper, a contented disposition, and the digestion of an ostrich. It is one of the compensations of life that as conditions become harder and more strenuous, and food scarcer, that the zest in eating increases. "The sleep of a labouring man is sweet, whether he eat little or much, but the abundance of the rich will not suffer him to sleep." The vacation camper and the soldier in active training come to relish plain food without fancy accessories and refinements, and the sojourner in Eskimo land, having separated himself from the "flesh-pots of Egypt," or rather the fruits and vegetables of the temperate climes, as a rule comes to enjoy most of the foods of the country. The scarcer they are the more enjoyable they seem at the time. Personally, I have found "living on the country" (where the country was at all kind) was more appetizing and healthful than the monotonous beans, beans, bacon, and more or less doubtful bread of the old "sour-dough." That applies to the gastronomic standpoint, but from the standpoint of practicality and efficiency, the white man, like the native who lives on the country, finds that accomplishing that feat leaves little time for other work.

THE LOCATION OF TOWNS AND VILLAGES IN THE OTTAWA VALLEY.

By J. Keele, Ottawa.

INTRODUCTION.

The location of the towns and villages in the Ottawa valley was not determined by chance or by the whim of individuals, but was generally decided by some prime necessity of the early settlers. The chief necessity after habitations were erected, land cleared and crops grown, was a mill for gristing purposes. The most convenient falls or rapids on the nearest stream was made available for this purpose, and a mill was erected there, generally by private enterprise. As everyone came to the mill, it would be good business to place a general store in its vicinity, also a blacksmith shop. Here then was the nucleus of a village, a town, or perhaps a city. The city of Ottawa, as we shall see later, had this origin. Another prime necessity of early settlement was transportation, in which many stretches of navigable waterways on the Ottawa and its tributaries were utilized to their fullest extent, so that several villages and towns had their starting point in the wharf, storehouse and stopping place which marked the point of transfer from road to water transport. The village of Aylmer, Que., is an example of origin from a transfer point on such a route.

To a lesser extent convergence of highways have been starting points for towns, but for the most part they have never grown beyond the small groups of dwellings and a single store, with perhaps a church, now known as so and so corners. The village of Shawville, in Pontiac County, Que., may be taken as an example of location at convergence of highways.

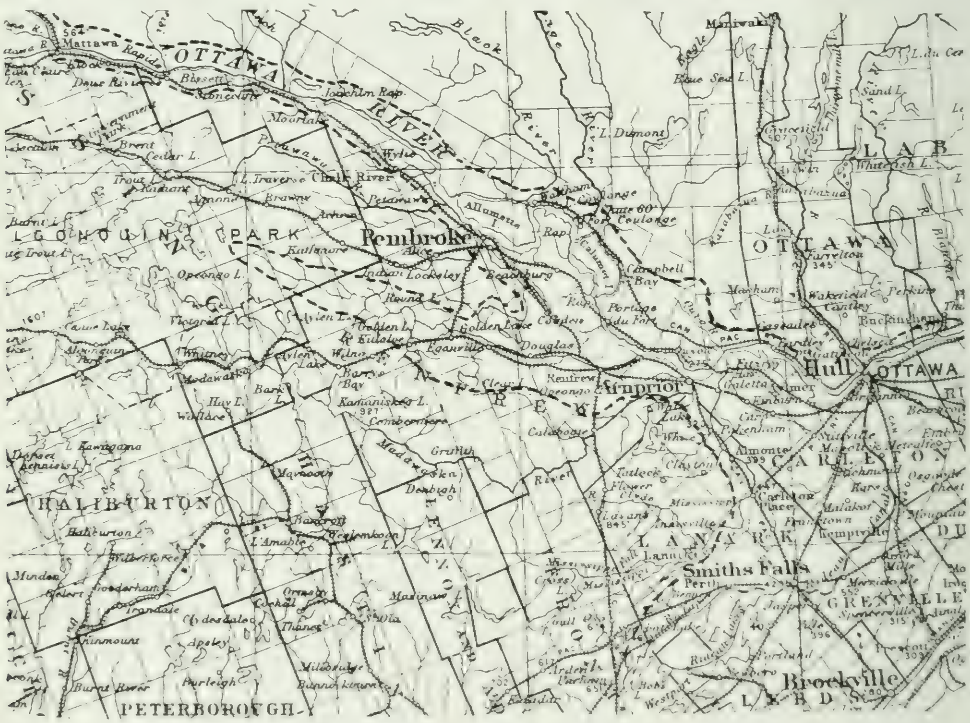
The needs of the surrounding farming community, the character of the land, the lumber industry, fur trading and the railways all contributed to the growth of those early centres of population. These influences will be discussed later.

The following notes refer more particularly to that portion of the valley between the city of Ottawa and the town of Pembroke, which includes portions of Carleton, Lanark, and Renfrew counties on the Ontario side of the river, and Pontiac and Wright counties in the Province of Quebec.

This slight sketch is submitted to the readers of THE OTTAWA NATURALIST as a study in geography. We start with the hypotheses that every city, town and village in the Ottawa valley began at a waterfall, or on an old transportation route and gradually developed according to certain influences which may or may not be connected with geography.

PHYSICAL GEOGRAPHY AND GEOLOGY.

The Ottawa valley is a wide depression extending in a northwesterly direction. It is bordered by a generally well defined escarpment of Archean rocks mostly granite gneisses. The river flows down this depression through a series of long narrow quiet water reaches, called lakes, which are connected by much narrower and shorter stretches of rapids or falls. The river forms the boundary between the provinces of Ontario and Quebec.


Mattawa
OTTAWA RIVER
ALGONQUIN PARK
Pembroke
Chalk River
Petawawa
Maniwaki
Campbell Bay
Portage du Fort
Golden Lake
Eganville
Douglas
Renfrew
Arnprior
Calabogie
Hull
OTTAWA
Buckingham
Wakefield
Almonte
CARLETON
Carleton Place
Kemptville
LANARK
Smiths Falls
Perth
GRENVILLE
Brockville
HALIBURTON
Haliburton
Minden
Whitney
Bancroft
PETERBOROUGH

MAP OF A PORTION OF THE OTTAWA VALLEY.

The heavy dotted lines indicate approximately the escarpments bounding the valley plains. Nearly all the towns and villages and the bulk of the population in the region shown by the map are included in the area between the dotted lines.

The elevation of the river is 127 feet above sea level at Ottawa and 364 feet at Pembroke, the distance between these points being about 90 miles.

The escarpment on the Quebec side of the river rises in places to a height of 1000 feet above the river levels, and often presents a wall-like aspect, but on the Ontario side it is not so abrupt, especially in the southern portion of the valley, where the Archean upland merges into the valley plain on a gentle grade with no well marked escarpment. The abrupt transition from the valley plain to the upland is probably seen to best advantage between Kingsmere and Eardley beginning a few miles northwest of the city of Ottawa. The valley wall is here about 700 feet high and forms a marked contrast to the Ontario boundary on the opposite side of the valley between Carleton Place and Perth where it is merely a gently sloping ridge about 100 feet above the inner edge of the plain.

The great upland of which these escarpments are features is often referred to in various literature as the Laurentian mountains or the Laurentian plateau. Geologists often call it the Archean upland because it is composed wholly of rocks which as far as they know are the oldest in the world, and they usually stand at a higher elevation that the Paleozoic rocks which form a fringe around their southern and northern edges.

The Ottawa valley is more or less plain-like in the southern part and has a width of about 28 miles in an east-west direction between the escarpment near Ottawa to that at Almonte. At Arnprior the width of the valley is about 18 miles. Above this point the continuity of the plain is broken by many ridges of igneous rocks isolated from the main escarpment, such as the ridge north of the town of Renfrew.

The principal tributary streams to the Ottawa on the Ontario side are the Rideau, Mississippi, Madawaska, Bonnechere and Petewawa and on the Quebec side are the Gatineau, Coulonge and Black rivers. All these rivers except the Rideau have their source in the Laurentian upland and descend over generally steep gradients with mostly insignificant valleys in the general upland with the exception of the Bonnechere valley which is almost as large as the Ottawa valley above Renfrew.

The prevailing rocks of the region are granite gneisses with which are associated some minor areas of crystalline limestones, schists, gabbro, etc. These rocks are of Archean origin and they form the escarpments and the vast upland behind them to the exclusion of all others. It is probable that the entire valley bottom was at one time floored with layers of later rocks, such as sandstones, shales, limestones and dolomites. These rocks have been so much worn down by various agencies of erosion, that only patches of them remain, and the old floor of Archean rocks on which they were laid down now forms the bed rock over large areas of the valley.

The bed rock is concealed over the greater portion of the valley plain by a sheet of unconsolidated material consisting of varying thickness of sand, gravel, and clay. These materials are either directly glacial deposits or are the results of the glaciation of the region.

In glacial times the region appears to have been covered with an ice sheet of considerable thickness such as covers Greenland and the Antarctic continent at present. The weight of this ice appears to have depressed the land surface to such an extent that the sea was able to flow into the Ottawa valley when the ice finally melted. Conditions were then similar to what they are now in the St. Lawrence below Quebec. In other words the marine estuary reached up to about the military camp at Petawawa at the close of glacial times. As the land rose when relieved of its immense burden of ice the sea margin gradually withdrew to succeeding lower land levels until it came to its present position in the St. Lawrence valley. The sediments which were accumulated in this narrow sea are now the most valuable asset which the Ottawa valley possesses as they are the bases of the agricultural wealth of the region. Furthermore there is probably no other region in the world where a recently drained sea bottom is available for human inspection and use on such a scale as the one now in view in the St. Lawrence and Ottawa valleys. It is a source of never failing profit to the farmer if he uses it aright and a source of never failing interest to the field naturalist. This belt of stoneless marine clay has had much to do with the growth of towns and villages located on it.

The great mounds, ridges, or sheets of sand, gravel or stony clay were also contributed by the ice sheet either during its advance or retreat.

Some of this material is covered by the marine clay but a great deal of it is exposed. Many of these sand and gravel heaps are moraines, being the results of drainage from the margins of the melting ice. These morainal ridges or mounds are generally striking topographic features in the valley plain. They have their economic uses, as the sand and gravel for building purposes and road making are drawn from this source. A striking instance is the Rideau moraine which extends from Ottawa to Prescott, and if the Ottawa-Prescott road is ever built, doubtless most of the materials for its construction will be furnished by the boulders, sand and gravels of this moraine.

AGRICULTURE AND FORESTS.

The agricultural possibilities of the region are rather rigorously defined by the geology. The greater part of the rugged uplands beyond the escarpments that border the Ottawa valley are underlain by granite gneiss and covered with only a thin layer of stony drift or not at all. These areas are absolute forest land and should never have been cleared for cultivation. The lesser areas underlain by crystalline limestone are generally depressions on account of the relative softness of these rocks to the granite gneisses which form the ridges surrounding the depressions. These limestone areas are covered with sandy loam which is capable of cultivation. So closely does agriculture follow the limestone bands in the Laurentian upland that it would be almost possible for a geologist to map these bands by mapping the cultivated areas, as the farmer follows them up just as a miner follows ore shoots. At certain points in the upland there are glacial morainic ridges generally composed of sand and gravel with smooth outlines which are almost sure to be cleared and cultivated. This light sandy soil becomes unproductive after four or five years of cultivation, unless well manured, and even then does not produce good crops unless during unusually wet seasons, so that it is doubtful if it is economy to try and cultivate these sand ridges instead of leaving them in forest.

Farms are constantly being abandoned or several abandoned farms are fenced into one pasturing ground or ranch for raising cattle.

Conditions such as these tend to sparseness of population and inhibit the growth of any large towns within the Laurentian plateau.

The valley of the Ottawa below the 500 foot level is for the most part covered with a heavy mantle of drift so that over large areas no bed rock at all is exposed. The soils vary according to the underlying drift deposits, which vary from very sandy porous soils to those of the heavy, sticky, stoneless, marine clays which are so retentive of moisture. As a general rule the clay soils occur in the flat plain-like areas and the sandy and gravelly soils in the ridges and rolling country. A typical illustration of this occurs in the farming district west of Arnprior where the flat clay plain is bordered by sand and gravel ridges. All of the level areas, however, are not clay plains but are underlain by flat-lying dolomites with only a thin layer of sandy soil. There are many such areas of thin soils in the southern portion of Lanark and Carleton counties.

Wherever any large area of forests occur in the Ottawa valley the reason that they are left in timber and not cultivated is either that they are situated on land in which the bed rock is too near the surface, or they are on land which cannot be drained, or on land which is so sandy that it would be practically barren under cultivation. In other words, forested areas exist only on lands which are fit for nothing else. On the other hand it is true that many patches of land where cultivation is attempted is only adapted to timber.

The stoneless clay areas are the most sought after and are the most productive. The clay occurs in patches at various places in the valley up to about 5 miles north of the town of Pembroke, where it is replaced by the sands of the Petewawa area, and the sand and gravels continue up to Mattawa, a distance of 100 miles above Pembroke. It is worth noting that there is neither a town nor a village in the latter portion of the Ottawa valley.

INDIAN OCCUPATION.

The first explorers into the Ottawa valley tell us little or nothing about how the Indian lived and moved and had his being. If it were not for the patient work of the modern archeologists and anthropologists we would still know very little about what kind of clothes they wore, the food they ate, the weapons and tools they used, how the women made their pottery and baskets or the hosts of things we would like to know about a primitive people.

Among the meagre accounts we learn that there was a village at Hochelaga (Montreal) and another on Allumette island on the Ottawa, but no trace of the latter has been discovered.

Through the efforts of archeologists we now know of the sites of several prehistoric Iroquoian villages in Grenville and Dundas counties which border on the St. Lawrence river. The best known of these is at Roebuck, near Spencerville, which was explored by Mr. W. J. Wintemberg. These village sites are situated from 2 to 10 miles away from the banks of the St. Lawrence and very often not near any large stream. We do not know all the requirements of the Indians in selecting their village sites but slightly elevated sandy spots with openings in the forest in which to grow grains were among them.

Possibly they were selected with a view to seclusion from the attacks of the more unsettled and hostile tribes who frequented the main waterways.

There has been very little archeological work done in the Ottawa valley between Ottawa and Pembroke or on the tributary streams and consequently we have much to learn about the Indian occupation, except that they used the main river in journeying up or down the valley. It looked as if the Indians never left the main valley, and indeed why should they, as there was an abundance of game and fish there to supply the wants of the few people that inhabited it. They went into the highland probably for two reasons, either to escape the attentions of hostile tribes or to hunt beaver.

We hear a great deal about the importance of fats these days, but consider how little fat the prehistoric Indians in the Ottawa valley were accustomed to. For the greater part of the year there is not a particle of fat on any of the deer family or the bears. The beavers are fat when other animals are lean, they are highly prized by the Indians everywhere for their flesh and skins, and so they will make extraordinary journeys in pursuit of them if they happen to be scarce in their accustomed hunting grounds.

Indians never go up rough rivers if they can avoid them, consequently we find little or no trace of them along such rivers as the Gatineau, Madawaska, Coulonge or Petewawa rivers, but numerous relics have been found along streams which furnish good canoe routes such as the Lievre, Rideau, Mississippi and Bonnechere.

In the portion of the Ottawa valley we are considering, only one prehistoric indian village is as yet known. It is situated on the north shore of Mud lake, an expansion of the Bonnechere river between Eganville and Golden lake. This site was discovered by Mr. Wintemberg, who examined a portion of the valley of the Bonnechere during the summer of 1917 at the suggestion of the writer. The village when excavated will probably turn out to be the largest Algonquin site so far known to archeologists.

This site had undoubted advantages for a people who earned their living by hunting and fishing. It was connected to Doré lake to the north by a trail about 4 miles in length and to Clear lake about 8 miles to the south. The Bonnechere river is an easy canoe route, and the valley as a whole must have been a great game country in former times.

It may be, however, that the Indians had few villages or fixed places of residence in this region, but they had certain routes of travel and definite camping places which were inhabited according to the season, or the kind of game they were hunting. A temporary camping site of this kind was discovered by the writer at the mouth of Brennan creek on Golden lake. At this site a number of old hearths were found on the high sandy ground overlooking the lake, and a few fragments of pottery were found in the wave cut bank. There were also numerous fragments of quartz from pegmatite dikes which the Indians had tried to chip into arrow points.

As there was no copper or suitable stone for tools and weapons in this region the Indians were dependent on trade with outside sources for these necessary supplies. The flint which was so largely used for arrow points, spear heads, scrapers, and skinning knives, came either from Welland county on Lake Erie or from Flint Ridge, Ohio. The schist or slate used for axes, hammers, or wedges was probably the Huronian slates which occur on the west side of Lake Temiscaming, although Mr. David Boyle, the late Provincial Archeologist, stated that slate suitable for tools was found on the Rideau lakes, but this statement has not been verified to the writer's knowledge. The copper undoubtedly came from the Lake Superior region, but weapons made from it appear to have been comparatively rare, and only possessed by the chiefs or profiteers of the tribes.

There were evidently two routes of communication between the Ottawa valley and Lake Huron, one being by way of the Mattawa river, Lake Nipissing and the French river to the Georgian bay, which is recorded in history. The other route followed the Bonnechere river to Round lake, going from thence up the Sherwood river with a short portage to Barry's bay on the Madawaska waters. The York branch of the Madawaska, a comparatively easy canoe route was followed westward to the head waters of the Trent river. From Balsam lake on the Trent waters a portage was made to Lake Simcoe from which the Severn river leads to Georgian bay. The latter route was traced by the aid of archeology alone.

A considerable diversion was made by the Indians in travelling up the Ottawa in order to avoid the long detour and rough water stretches between Lake des Chats and Allumette lake. This side route followed a chain of small lakes and streams in Renfrew county and was more direct. Practically the same route was followed later by the lumbermen and white settlers, and the village of Cobden at the foot of Madawaska lake is the result of this early travel.

EARLY SETTLEMENT.

The first settler into the region we are considering was Mr. Philemon Wright, of Woburn, Massachusetts. He explored the St. Lawrence and Ottawa valleys between Quebec and Ottawa during the years 1796 and 1798, and selected the township of Hull as the most desirable location for settlement in the region. He accordingly left Woburn on the second of February, 1800, with 25 men and an outfit of horses, cattle, sleighs, tools and provisions. He reached the foot of the Long Sault Rapids* on February 13, the end of settlement and roads at that period. From this point the outfit had to break their own roads through the deep snow so that it took them six days more to reach the township of Hull. A grist mill and saw mill were built in 1802 on the Chaudiere falls which Mr. Wright called Columbia falls. In 1811 three large well equipped farms had been established, the Columbia, Britannia, and Gatenoe, with areas of 800, 700, and 800 acres respectively.

The details relating to this settlement are given in a paper by Mr. Wright before the Committee on Crown Lands and published in the Tenth Report, 1824. The paper gives the year's events of the growth of the settlement and covers a period of 23 years. It is worth while quoting his reasons for selecting the site. After a description of the Chaudiere falls he goes on to say: "The mill sites upon these falls, exceed every thing a person can have an idea of, one hundred mills, might be placed there without the smallest injury to each other with perfect safety. I have two mills at this place, which are doing business for persons who reside near 100 miles up and down the river. These falls are composed of remarkably fine limestone. I have no doubt but lime could be made here at half the expense required in any other place—I generally make large quantities every year, and it will be found to be of the greatest advantage for agricultural purposes. No place affords such quantities of valuable building stones as this place, and at the same time so easy to be obtained, as it lies upon the surface of the earth. There is also a remarkably fine bed of iron rock ore within four miles of this place, lying on the height of a declivity and in strata not more than 18 inches under the surface of the earth; and the time is not far distant when this iron ore will become valuable and of the greatest advantage to the interior part of the country, as we have already made use of some and find it of the best quality. Finding this place to be the most advantageous for making a place of deposit for my general concerns, owing to the easy access to the water communication up and down the river, and the stoppage by reason of the portage, I thought to expend considerable money in clearing land and building, knowing its local situation could not be rivalled by any, having two large rivers emptying into the Ottawa near this place, the Gateno from the north and the Rideau from the south, and generally a good surrounding country. All these things were flattering even to overcome the disagreeable sensation of thinking that I was 120 miles from all business, and 80 miles from any settlement; however, I was determined to use every exertion that lay in my power, with a full hope and expectation that at some future period, it would become a second Montreal; such was then my opinion and is now, from convincing proofs from twenty years' experience. Since that time I have commenced clearing and building, and have also laid down the site of a village fit for business, which has answered my expectations in every respect."

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*The rapids between Grenville and Carillon on the Ottawa river.

There were several organized settlements directed into this region at a later date, and some of the sites may have been as deliberately chosen as the above with regard to water power. It is probable, however, that most of the locations were chosen with regard to suitable farming land first and the site for the mills decided on later.

In 1806, Mr. Wright sent the first raft of logs from Hull township to Quebec and we read elsewhere that lumbering on the Bonnechere river was begun in the year 1820. It is probable that much of the early settlement followed in the wake of lumbering operations, as the settlers in the outlying districts were able to sell grain and pork to the lumberman, who was in fact their only customer. Skilled labour, such as coopers, millwrights, blacksmiths, and wagon-makers, was in much demand both by the lumber companies and the farmers.

We find many instances of settlers taking up land within the borders of the Laurentian plateau in preference to the valley plain lands, because the bottom lands were either too wet or the forest growth was so heavy that much labour and time had to be expended before a crop was sown and harvested. On the other hand the upland contained patches of thinly-wooded, light soils, on which with very little expenditure of labour a crop of potatoes could be grown during the first season of occupation.

While the upland farm provided an immediate support for a settler and his family he generally found before many years had passed that it would be wise to secure land in the valley plain if possible. The necessity for this change became apparent when the light soils of the upland became exhausted unless replenished with stable manure which, however, was not always available in sufficient quantity, and also because of a certain degree of isolation, which was inevitable owing to the rugged character of the land. Hence the farmer often acquired clay land in the valley plain adjacent to the upland, and making this the mainstay for his support, turned his upland farm into a pasture and wood lot for fuel.

The construction of colonization roads over the valley plain gave access to those lands which were not accessible from the rivers and gradually the process of clearing, draining and cultivation was accomplished over the whole area.

Whatever prosperity and growth the towns achieved since the first settlers began cultivation have been due almost entirely to the productiveness of the land and the variety of products which could be raised upon it. Lumbering, railways, industries, and mining have contributed their share but the fundamental cause of prosperity was and still is agriculture.

MINING.

Although mining of various minerals has been carried on for the last 70 years in portions of the Ottawa valley we cannot point to any town or village which has grown up in the neighbourhood of an ore body and supported wholly by mining such as the towns of Cobalt, Timmins, and Sudbury in Northern Ontario. One very evident reason is that so far there has not been an ore body of the right kind of sufficiently large dimensions to ensure the building of a mining town in its vicinity.

Iron mining never fulfilled its early promise to become one of the permanent industries of the region, and although there are several bodies of iron ore in Pontiac, Lanark and Renfrew counties, they are not commercial ores from the present day point of view. These ores, however, constitute a reserve for the future when economic conditions permit of their treatment for use.

The village of Bristol Mines in Pontiac County, Quebec, is an example of the beginnings of a centre due to mining development, but it never attained to any size and is now practically deserted.

Pyrite and molybdenite are the principal metallic minerals mined now in the Ottawa valley. The occurrence and exploitation of the large deposit of the latter mineral in the vicinity of the village of Quyon, in Pontiac county, has recently caused a considerable influx of business to that point. The non-metallic minerals have been the most important sources of revenue in this region. These include graphite, mica, phosphate, feldspar and limestone as the principal ones, with celestite, barite and fluorite as minor occurrences.

Mining is generally a costly business when compared with agriculture, and much money is expended in hardware and other equipment and for labour among the communities where it is carried on. It gives employment to the farming population of the upland districts during their spare time especially in the winter, when they formerly depended on lumbering operations as a source of wages.

(To be continued)

THE GENUS VESPA IN CANADA.

KEY TO THE SPECIES.

BY F. W. L. SLADEN, APIARIST, DOMINION EXPERIMENTAL FARMS, OTTAWA.

The wasps of Canada, the word "wasp" being used in its strictest sense to include only the genus "Vespa," fall into four groups:—the Norvegica Group, the Carolina Group, the Vulgaris Group, and the Rufa Group.

Four new forms are described in this paper, but how far they run into existing forms only extensive collecting and especially the taking of nests will show. In several cases, there is a dark northern form closely related to a yellow southern form.

1. Eyes not nearly reaching to mandibles, saggitae not fused together at the tip (Norvegica group) 2
   Eyes touching or nearly touching mandibles--6

NORVEGICA GROUP.

2. Large species (female length about 21 mm.), maculations white, not yellow, flagellum testaceous beneath, segments 1 and 2 entirely black.
   male 2061, female 2060, *maculata* L.
   N. S. to B. C. Makes aerial nest, constructing entrance tube when first workers are maturing. This is the well-known "Black hornet."

   Regular size (female length about 17 mm.), segments 1 and 2 nearly always striped more or less --------------------------------3

3. Markings yellow -----------------------4
   Markings white -----------------------5

4. Yellow band on segment 1 wider, interrupted or almost so in middle, small black spot or spots on clypeus, antennæ testaceous beneath, inner angle of stipes rectangular or acute, its hair shorter and denser.
   male 2064, female 2063, *diabolica* Sauss.
   Very common, N.S. to B.C., to 5000 ft. in southern B.C.

   Yellow band on segment 1 narrow, uninterrupted, clypeus divided by a black line, widened in middle, male antennæ black beneath, inner angle of stipes obtuse, its hair longer and less dense.
   male 2186, female 2187, *norvegicoides* n. sp.
   N.S. to B.C. Near to *diabolica* and the European species *norvegica* L.

5. No red spots on segment 2, stipes black, inner side strongly angled and margined with moderate amount of pale hair.
   male 2065, female 2062, *arctica* Rohw.
   (=*borealis* Lewis)
   N.S. to B.C., not common. Only males and females known. Parasitic in nests of *V. diabolica.*

   Segment 2 with lateral red spot, stipes pale, slender, inner side not angled, clothed with dense yellow hair.
   male 2077, neuter, *albida* n.sp.
   Alaska.

CAROLINA GROUP.

6. Dorsum with two (or four) longitudinal yellow stipes; female abdomen ochreous and black, neuter yellow and black.
   female 4015, *carolina* Sauss.
   Point Pelee, Ont. (Taverner).

   Dorsum entirely black, or (in *occidentalis* only) with two small spots, markings yellow or white --------------------------------7

   Hairs on segment 1 pale, saggitae fused together at tip, forming a spoon with slender stem.
   (*Vulgaris* group)--8

   Hairs on segment 1 black, saggitae fused together, forming a subtruncate club.
   (*Rufa* group)--9

VULGARIS GROUP.

8. Scape yellow in front in female and neuter; male has the surface of segment 7 concave, saggital piece not armed with thorns, slightly emarginate at tip, inner tooth of stipes truncate.
   male 4016, female 2069, *occidentalis* Cr.
   Lethbridge, Alta., to Victoria, B.C.

   Scape entirely black in female and neuter; male has a transverse declivity on segment 7, a long thorn on either side of base of terminal swelling of saggital piece, inner tooth of stipes pointed.
   male 2188, neuter 2071, *communis* Sauss. 8a.
   Common in eastern Canada. Makes underground nest.

8a. More extensively black. Clypeus with black line. Pronotal yellow stripe narrower, black spots on abdominal segments fused into the wider basal bands.
   female 2070, var. *communis* Sauss.
   More northern range. Probably only a melanic variety.

   More extensively yellow. Clypeus with small black spots, pronotal stripe wider. Black spots on abdominal segments free from the narrower basal bands.
   female 2170 var. *flavida* n.n.
   (=*pennsylvanica* of authors)
   More southern range.

NOTE—The only western male of *communis* in the Canadian National Collection is from Aweme, Man. (Criddle) and has the surface of segment 7 as in *occidentalis*. This suggests a possible gradation between the two forms.

RUFA GROUP.

9. *Tibiae bearing long erect black hair*, those on hind tibiæ almost as long as tibial spurs; angles on margin of clypeus more pointed than in *acadica*; tarsi somewhat larger and thicker, especially those of the fore legs; black on abdomen never extensive enough to enclose yellow spots except on segment 1, segment 2 with a narrow black basal band widened in centre and then spreading sideways.

female 2075, *austriaca* Pz.

Ottawa, Chelsea, Que., mid-June; Winnipeg, mid-July; Kaslo, B.C., mid-July. This species is parasitic in nests of *V. rufa* L. in Europe. Only males and females are known.

Tibiae practically destitute of long erect black hair, but sometimes a few short sub-decumbent black hairs on basal part of the joint-------10

10. *Smaller* (female length 14 mm., male length about 12 mm.) *Darker*. Clypeus flattened, anterior angles not specially prominent, *clypeus bearing a longitudinal black line* extending from near apex to base, widened apically. Lateral yellow stripe on prothorax narrow, parallel sided. *Segments 2 to 5* each *typically with a broad black band which in the female contains a small yellow spot near the apical margin on either side*. These spots occasionally reddish or absent. On segments 3 to 5 the black band is widened to receive the spots which may not be completely enclosed at the sides. In the neuter, spots are present rarely on second segment only, and these are reddish, and second ventral segment occasionally has a red lateral spot. Hair denser and longer especially on clypeus and segment 1, which is only slightly narrower than segment 2. Stipes dark, the apical portion narrower and more membranous.

male 4012, female 2072 *acadica* n. sp.

Nova Scotia, (not rare); Painsec, N.B.; Ottawa; Kaslo, B.C.; Victoria, B.C. Near to *vidua* and the European species *rufa*. Makes aerial nest.

Larger (female 17 mm., male length 14 mm.) Clypeus more convex. Anterior angles more prominent. *Clypeus with only 3 small black spots* near apex. *Yellow areas on prothorax and abdomen wider.* Hair, especially on clypeus and basal segment, more scanty and shorter. Segments 3 to 5 each have narrower basal black bands which in the female and neuter are angularly produced backwards in centre, with a line or black spot on either side, which on segment 2 or 3 is usually enlarged and fused into the angular production----------11

11. Segment 2 with a broad black band covering about eight-ninths of the segment in the middle. Yellow markings on thorax slightly paler than those on abdomen (? effect of cyanide). Prothorax stripe parallel sided. Stipes testaceous, the apical appendage wider and less membraneous.

male 2076, female 2073, *vidua* Sauss.

Female, Port Rowan and Simcoe, Ont. (G. S. Spencer); neuter, Chatham, Ont. (F. W. L. S.); male, Toronto.

Segment 2 with the black area only slightly more extensive than on segment 3. Tint of yellow uniform. Prothoracic stripe subtriangular, nearly as wide as long in female.

female 4013, neuter 4014, *atropilosa* n. sp.

One female Lethbridge, Alta. (F. W. L. S.); many workers, Vernon, B.C.; Keremeos, B.C.; Okanagan Landing, B.C. (F. W. L. S.)

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THE LOTUS LILY OF SAINT WILLIAMS.

By Arthur Herbert Richardson,
Norfolk Forest Station, Saint Williams, Ontario.

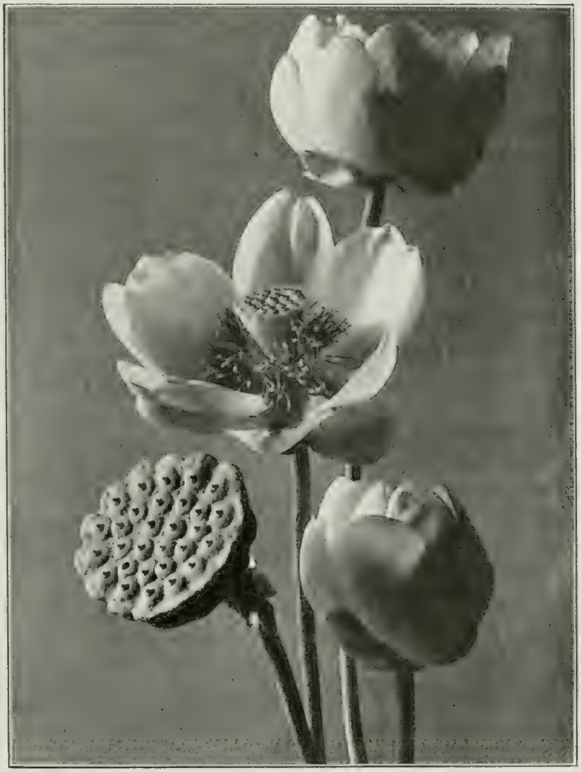
It was August the twenty-fourth of the present year that I first made the acquaintance of this rare plant. I had waited purposely until I knew the flowers would be open to the sun in order that I might have a first and lasting memory picture of the blossoms at their best.

The bed occupies a part of Long Point Bay, Lake Erie, a few hundred feet west of where the village road of Saint Williams descends the cliff to the beach, and is about ten acres in extent.

The Lotus Lily, *Nelumbo lutea*, (Willd.) Pers. is a native of American and not introduced as some have thought. And one may well wonder how a plant of such rare occurrence has acquired so many different names, for it is known in different parts of the United States as: Sacred Bean, Yellow Nelumbo, Water Chinquapin, American Lotus or Nelumbo, Great Yellow Water Lily, Wankapin or Yankapin, Duck-acorn and Rattle-or Water-nut.

The flowers are pale yellow in color and vary from five to ten inches in width. Before they open, the buds are the shape and size formed by the two hands placed slightly curved so that the wrists and finger-tips meet. The leaves vary in size from three to four inches to two feet in diameter. They are nearly orbicular and often have the centre slightly depressed or cupped. Unlike the flowers of the Sweet Scented Water Lily or the Yellow Pond Lily which float on the surface of the water, the flowers of the Lotus Lily stand high above the surface. Occasionally too, the leaves do likewise, but the majority of them float on the surface of the water in the same manner as the leaves of the other two lilies but are easily distinguished from these by the absence of a deeply-cordate cleft at the base. The fruit is an inverted cone which dries when ripe, enclosing the hard seeds in little cavities. Because of the rattling sound made by them, the plant has received (in some localities), the name of Rattle-nut.

From the information I have been able to gather about this plant, its occurrence in Canada seems to be very uncommon. Gray's Manual of Botany includes Lake Erie and Lake Ontario in a general way as its range but mentions no specific place. Britton and Brown's Flora does not mention it from Canada at all. Macoun's Catalogue of Canadian Plants 1883, reports it in the Detroit River and near the mouth of the Welland Canal. Dodge's Catalogue of the Flora of Point Pelee, mentions only the Ohio shore, and Spotton, in compiling his Ontario Botany, either did not know of its existence, or did not consider its occurrence common enough to mention. From the foregoing, therefore, one may well conclude that unless the plants in the Detroit River and the Welland Canal mentioned by Macoun in 1883 are still there, Saint Williams, as far as is known, is the only place in Canada where the Lotus Lily grows.



THE LOTUS FLOWER.
(Photo by P. A. Taverner; from The Canada Year Book, 1915.)

The bed of plants at Saint Williams is in a sheltered place and unless something extraordinary happens there is little fear of its being exterminated. Someone has erected a wire fence a few hundred feet in length along the shore side of the bed, whether for protection or not I am unable to say. When I visited the place in August, there were hundreds of lilies in flower. No one—except a fifteen-inch snapping turtle, which made a pass at my bare ankle—prevented me from taking all I wanted.

ORIOLE INSTINCT.

By J. A. Munro, Okanagan Landing, B.C.

Mr. Taverner's note in the May issue, describing the nest built by a pair of young orioles, recalls an experience with a nesting pair of the Bullock's Oriole, in the summer of 1911. As in the case of the pair Mr. Taverner had under observation, the male was a bird of the previous year and it was taken for granted that the female was also.

The writer was camped under a group of quaking-aspens on the shore of Okanagan lake and in one of these trees the orioles had started building. The branch to which the nest was fastened was an upright one, half an inch in diameter, close to the top of the tree and some twenty feet from the ground. Attention was drawn to the partly constructed nest, by the efforts of one of the birds to draw out a linen thread from a bath-towel, hung over a wooden railing near the nesting tree. With the end of the thread held in the bill and with feet braced against the railing, the bird tugged and worried at the thread until it became loose; then with one decisive jerk, flew with it to the nest. This was repeated several times; an inexhaustible mine of building material had been found.

Having often read of the oriole's instinctive rejection of colored string for nesting material, it was thought to be a good opportunity for experiment along this line. Accordingly an assortment of various colored yarns, white, pale blue, red, black and pink were cut into convenient lengths and placed in a row on the bath towel. In a few minutes the female returned to the towel-rack and finding this loose material, a new treasure-trove on top of her linen mine, made no attempt to pick out more threads as long as the white yarn was available. The colored yarns were not touched and when the supply of white was exhausted, the towel again came in for attention. The reputation of the species for sagacity seemed to be established.

She worked most industriously, taking, on an average, five minutes to weave into the nest a piece of yarn twelve inches in length and a minute or a little longer to return and select another piece. Before alighting on the towel-rack she always gave the characteristic harsh call-note.

The female did most of the building; indeed it was not certain that the male performed any of the work; their similarity, and the fact that they did not appear together, made it difficult to recognize the sexes.

Anxious to discover if this instinctive selection of neutral-colored material would operate under more complicated conditions, the colored yarns were collected and to each of them was knotted a piece of white yarn of the same length and they were placed again on the towel rack, with the white portion uppermost. Without hesitation she began carrying off the pieces, with the white portion held in her bill; the white half was woven into the nest and the colored half allowed to hang from the outside.

Oriole instinct was at a discount now, and I became bolder in my experiments. Selecting some soft thick yarns, in red, green and black and, when fluffed out, of the diameter of a pencil, I tied these in twelve inch lengths to short pieces of fine white yarn. These were taken as quickly as the last; the short ends of white woven into the fabric of the nest and the larger colored portion allowed to hang from the outside. It was amusing to see the bird fly into the tree with a long brilliant streamer trailing behind.

The nest was now ablaze with color, long gaudy strands hung from all points, six to ten inches below the bottom. To add to the color-scheme I tore into strips, a necktie of a particularly violent pattern in red and green, and tied on the usual piece of white yarn. The bird was now utterly demoralised and did not balk at this singular adornment. Several pieces were added to the upper part of the nest.

The polychromatic structure was now completed; the eggs were laid and the nestlings raised without mishap, while the decorations waved in the breeze to the wonder of the passerby and perhaps the confusion of marauding, egg-hunting crows.

A closer examination of the nest after the young had flown, revealed the fact that it was of unusually poor workmanship, loosely made from various kinds of string, through which was woven, the white yarn; the slight lining was of black horsehair; no roots or other fibrous material had been used.

GERMAN BIOLOGY.

By P. A. Taverner.

It may seem out of place to use the pages of a scientific journal for the expression of international recrimination, especially during the heat and prejudice of war; but one phase of the Hun's hunnishness is a direct challenge to modern biology and should have a biological answer.

The position of the German scientist is something as follows: Nature evolves to higher planes through struggles between competing forms and the consequent triumph of the strong through the relentless elimination of the less fit. Man is an animal and war is as much a biological necessity for his development as it is for that of the lower creation. Therefore, for the future benefit of the human race, weak powers must give way to more virile expanding ones, permitting them to sow the earth with the seed of a superior race and culture. Political might is thus right, weakness the greatest wrong, and forbearance towards the weak enervating sentimentality and the betrayal of the human race.

The reasoning is characteristically Teutonic in its blind confidence in its own logic. Other schools of thought on reaching so monstrous a conclusion would pause and retrace their mental steps to see where they had departed from the direct path of truth to land in this unthinkable quagmire. Not so the German. To him the laws are immutable and if the result shocks our senses it is our standards that require revision. They point to their premises and to the conclusion, never doubting for a moment the reasoning between.

The deductions are admirably direct and clear to the German intellect but here as elsewhere the Teuton neglected to consider the human element. He can handle ohms and watts and foot-pounds admirably, but whenever he has attempted to estimate the strictly human equation he has lamentably failed. In this case he failed to perceive that biological laws apply only to the biological (the physical) side of man; that man is of dual nature and moral development is as necessary to his well being as is his body. Man may be an animal but he has developed something that no other animal possesses. He has a moral sense and whether you call this "soul" or merely "community instinct" it is an absolute necessity to his communal existence. Without it, civilization, and the power over nature obtained through mutual assistance and confidence, could not persist. Biological evolution of the physical body may produce the super-beast, never the super-man; that can only be the result of a concurrent and equal development of the moral being, and the two are diametrically opposed to each other, one being the result of absolute selfishness, the other of unselfishness.

It would thus seem that we have only discovered the pathway to advancement to find that we cannot use the knowledge to our own improvement and the way is barred against us. There are many truths we can see without being able to consciously profit by them. It is undeniably better that one should suffer rather than many, yet we cannot allow any justification for canibalism. Old age is a drag upon the body politic. It consumes and can not produce, but we cannot therefore advocate the killing of our grand-parents. These things are against public policy and however apparent their advantage in certain directions, they would cause incalculably greater racial harm through the consequent deadening of sensibilities and destruction of mutual confidence.

These are the things that German science failed to perceive. That however admirable natural laws are in themselves there are certain of them that we cannot consciously take advantage of. The great compensation to this, however, is the fact that biological laws work in spite of us. We have not developed our physical being consciously so far, nor need we in the future; Nature will take care of that without our assistance. Our moral development on the contrary is in our own keeping, if we look after that side of our nature, Nature will do her duty with the rest. In our bolstering up the weak and caring for the dependent it may appear that we are working at cross purposes with our own physical good, but

> "Though the mills of the gods grind slow
> they grind exceeding fine"

and the evolution of the morally as well as the physically fit is continuing. War at times is a good thing, but only after every possible effort to avoid it. It is eliminating the morally unfit now that their pernicious doctrines may not contaminate the world and cause devolution, in place of evolution.

Nov. 5, 1918.

NOTES AND OBSERVATIONS.

Excursion of the Vancouver Natural History Society.—On Saturday, August 31, and Sunday, September 1, the members of the Vancouver Natural History Society held their annual excursion for the study of the local alpine flora, the slopes and valleys of Grouse and Dam mountains being the objectives.

The season was so far advanced that many of the plants found in previous years were past flowering and were in fruit.

During the evening of the first day the members had an opportunity of becoming familiar with quite a number of different trees, as for instance the Sitka spruce of so much value at the present time for aeroplane work, red alder, Sitka alder, dogwood, wild cherry, giant cedar, white pine, douglas fir, hemlock, yew tree in fruit, besides a number of willows and shrubs constituting the undergrowth of the forest.

Next morning by 8.30 the party was on the trail again. On account of the rather open nature of the mountain along the bluffs, there were numerous specimens found, including ferns, saxifrages, pentstemons and other rock-loving plants. The plateau was reached about 11 a.m. Here the vegetation was of an entirely different character; instead of a covering of salal was a covering of red and white false heathers, some belated specimens of both were found in flower. The underbrush was composed of white rhododendron, copper bush, two or three species of large, luscious blueberries like grapes, and mountain ash with beautiful clusters of coral-red fruits in a background of dull green.

Proceeding by the lake and over the peak of Grouse, the members continued to the slopes of Dam mountain, where they found further alpine or subalpine specimens, including the marsh marigold, false hellebore (a poisonous plant), mountain flea-bane, arnica, grass of Parnassus, with its beautiful white flowers, Alpine speedwell often called forget-me-not, and the Sitka valerian, but one of the most interesting was a little moss-like flowering plant, *Hippuris montana*, or mountain mare's tail, which is recorded as found on flats along Glacier Creek in the Selkirks, and also in Strathcona Park, Vancouver Island. The plant is so small that individual specimens are readily overlooked, but there are several large patches on both Grouse and Dam mountains.

Lunch and rest was enjoyed on the summit of Dam mountain, from which an extensive view of the surrounding country was obtained, from Mt. Baker, with its glacier-covered northern slopes to the mountains of Vancouver Island, and the mountainous country to the north.

After lunch a number of the more seasoned climbers ascended Goat mountain and were rewarded by the discovery of Tolmie's saxifrage, *Saxifrage Tolmei*, a small fleshly leaved species usually found in regions of glaciers and perpetual snow. This year, however, the snow was practically all gone, there being only a small patch at the base of Crown mountain.

Numerous birds, butterflies and other insects were observed during the outing.—J. D.

Transformations.—Bide-a-Wee Island, Blue Sea Lake, Que., July, 1918.—One morning lately at breakfast, in our open-air dining-room, we heard a slight thud on the ground. We went to see the cause. Various were the explanations of the strange looking object we found. One was: "A dragon-fly has a beetle." Another: "A bug has a darning needle." It took some time to grasp the true explanation, so swift were the contortions of the mystery. It was a large, splendid dragon-fly struggling to emerge from a small, repulsive-looking black case, which shortly before had been a dragon-fly nymph. How was it possible for that large, great, gorgeous creature, with its gauzy, shimmering wings, and brilliant black-green-gold body, to be enclosed in that small blackish object? After emerging, it rested on a branch of a tree for some hours, then after a few short trials it flew off strongly, into the nearby woods.

Bide-a-Wee Island, Blue Sea Lake, Que., July, 1917.—One morning this summer, while we were out on the water, suddenly we noticed its surface was almost covered with what looked like dead minnows. Mrs. Wisewoman explained that there had probably been a disease that had attacked the baby fishes, and their lifeless bodies had risen to the top. Next evening at sunset we were again on the water. That time we suddenly noticed that there was life in the thought-to-be dead little bodies. The surface was fairly quivering with motion. Out of these bodies shad-flies were struggling to emerge. Some came out gaily after a few convulsive efforts. Others had to try again and again, each time sinking back into the water, but at last they rose triumphant.

As we looked at the gauzy wings quivering and sparkling in the sunset rays and then down at the old, forlorn, shrivelled-up cases, we marvelled again over the wonder of Nature's creation.—M. E. C.

One of the results of the European war was a great shortage of dyes because the German supply was cut off. In 1917, the United States made enough to supply 75 per cent of their needs, and of some colors were able to export a surplus to the amount of nearly $4,000,000. In keeping up with this modern progress, the Philadelphia Commercial Museum has added to its extensive exhibit of coal tar products a series of seventy dyes "made in America". To the same exhibit has been added a collection of 67 specimens of synthetic flavors and perfumes. It is very interesting to the visitor to learn that perfumes such as rose, heliotrope, and lily of the valley; and flavors such as grape, apple, peach, and apricot, may all come from a lump of soft coal instead of from the flowers and fruits.

ANOTHER RECORD OF THE ROUGH-WINGED SWALLOW NEAR OTTAWA, ONT.—Prior to 1917, when the writer found two pairs of nesting birds eight miles above Ottawa on the Rideau river*, the Rough-winged swallow had apparently not been observed in eastern Ontario.

On June 5, 1918, the above-mentioned locality was again visited and, though others may have been overlooked, only one nesting site was observed, from which a female bird, nest and six eggs were collected, to be used as material in the preparation of an habitat exhibition group in the Victoria Memorial Museum. No feathers had been used in the construction of the nest, but a few dry poplar leaves had been introduced and also, for some unaccountable reason, several bits of fresh cow dung, which were found adhering to the comparatively fresh eggs.

In 1906, the nearest known breeding ground of the Rough-winged swallow extended along the southern shore of Lake Ontario, therefore the Ottawa records point to the probability that the species has either crossed Lake Ontario and extended its breeding range down the Rideau valley or has ranged around one or both ends of the lake and along the north shore to the Rideau waterway.

This species is reported to become common in localities where a few years before it was unknown, so no doubt future records of the Rough-winged swallow on the Canadian shore of Lake Ontario will verify one or more of the above stated suppositions. CLYDE L. PATCH, OTTAWA, ONT.

AN EPISODE WITH THE VIRGINIA RAIL.**—Difficulties are a stimulus to the bird student, just as they are to students in other lines, but while difficulties with many birds may be almost welcome, adding zest to the study, when it comes to the dwellers in the marshes, they are an exasperation, as there is usually so little hope of fathoming them. It is, therefore, the more incumbent on the favored person who has an enlightenment with any particular species, that he shall declare his luck to the world, hence this note.

On August 5, 1918, the writer was at one end of a crosscut saw, which was making quite a noise, though not one that was commensurate with the efforts applied at each end, and we heard, over the rasping of the saw, *ewa-ah, ewaah, ewaah*, several times repeated. The tone resembled that of the Black Duck, but more harsh and grating. The remark was made that such a noise might be made by a Florida Gallinule, but there would be no use in hunting it as a marsh bird is not a thing to be hunted in any active manner, the only successful method being to keep out of the way, and to be more or less still. So the sawing went on, and the noise was soon repeated. This kept on until some boys who were loafing around the waters' edge called out that there was a strange bird in a tuft of grass beside the pond. In a moment it was seen to be a Virginia Rail, and it soon proved itself to be the author of the strange sounds, by repeating them. Its mate approached it, and a response came across the 20 feet of water to the east, in the form of a shrill, high pitched whistling note, and very soon the author of this latter note, a jet black, downy young, about the size of a Catbird, swam across the open water, defying all dangers to get to its parent. It was followed by three others, and there were three or four more, whose courage was not equal to the task, and they remained on the east side of the water. But the four that crossed, swam and ran boldly after the parents, who now varied their calls with a *kik, kik, kik*, pitched very high, though it was several tones lower than the shrill piping of the young. The parents now led the young west into the long grass and were lost to sight, but at intervals through the day, came vocal reminders that the Rails had not left the premises, and about 5 p.m. the calls began to come from the vicinity of the crossing, and soon a bird (female?) appeared and crossed to the east side, followed as before by four young. Shrill pipings greeted her approach and doubtless she picked up the whole of those that were troubled with cold feet at the time of the morning adventure. My companion circled around ahead of them, and the mother bird led her brood within an arm's length to the stationary man who acted like a stump, and all vanished into the quiet swamp. On following days, these sounds were repeated, but the authors were no longer a matter of surmise, and no sounds were thought to come from the Sora Rail, which may not be breeding at the pond this year.

It should be added that the tone of the calls by the young resembled the squeaking of a door hinge, and the vocal sound was *Kee-a*, the final syllable being very short, while in the case of the old birds, the first syllable was so short as to be inaudible at any considerable distance.

W. E. SAUNDERS, LONDON, ONT.

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*The Ottawa Naturalist, June-July, 1917.

**Read before the McIlwraith Ornithological Club.

BOOK NOTICES.

In Audubon's Labrador,[*]_ By Chas. W. Townsend, Houghton Mifflin Co., 1918, pp. 354+xii, $2.50 net. This charmingly written book after a resume of Audubon's famous Labrador expedition in 1833 describes the route taken by Dr. C. W. Townsend, ornithologist, and H. St. John, botanist, in following in the wake of Audubon, on a coasting schooner in 1915, under the auspices of the Geological Survey. Aside from the light it throws upon the work of the Father of American Ornithology on this romantic coast, it contains much interesting comment upon the country, its inhabitants, resources and wild life. Powerful pleas are made for the protection of the eider ducks to preserve them from threatened extinction and the conservation of other neglected resources of this barren country. Advance publication of the matter on the eider has already appeared in the *Auk*, for January, 1914, and a similar article by the same author was published in the Seventh Annual Report of the Commission of Conservation of Canada, in 1916. Dr. Townsend has pointed out the necessity for the protection of wild life on this coast; the late international migratory bird convention has furnished the federal government with a further incentive and the means for doing so. It is to be hoped that determined steps will be taken in this direction before it is too late.

In the *Auk*, for July, is a paper of importance to Canadian ornithology.

Further Notes and Observations on the Birds of Hatley, Stanstead County, Quebec, 1916-1917; by H. Mousley, pp. 289-310. This is a further contribution to a similar paper by the same author published in the *Auk*, in 1916, and brings it up to the above date. It adds 41 species to those then listed bringing the number noted in the locality to 163, and establishes 15 more of them as breeders. To a copiously annotated list is added an interesting account of the conditions exhibited by the seasons under treatment, the changes and variations in bird life, and pertinent generalities. The annotations contain a great store of life-history, distributional and other data. It is a valuable addition to our ornithological knowledge of eastern Canada.

Forty-eighth Annual Report of the Entomological Society of Ontarlo, 1917. Published by the Ontario Department of Agriculture, 1918. This report of 127 pages appeared recently. It contains valuable articles of special interest to Canadian students of insect life. Among the more important contributions the following may be mentioned: "The Apple and Thorn Skeletonizer," by Dr. E. P. Felt, State Entomologist of New York; "Some Notodontian Larvæ," by Rev. Dr. J. A. Corcoran, Montreal; "The Problem of Mosquito Control," by Dr. T. J. Headlee, State Entomologist of New Jersey; "The Black Cherry Aphis," by Mr. W. A. Ross, Vineland Station, Ont.; "A Comedy of Errors," by Mr. F. J. A. Morris, Peterborough, Ont.; "Transcanadian Spiders," by Mr. J. H. Emerton, Boston, Mass.; "Dusting versus Spraying to Control Fruit Tree Insects and Fungous Diseases," by Prof. L. Caesar, Guelph, Ont.; "The Ecology of Insects," by Prof. W. Lochhead, Macdonald College, Que.; "Effect of Stable and Horn Fly Attacks on Milk Production," by Mr. A. W. Baker, Guelph, Ont.; "Potato Stem-borer and Zebra Caterpillar," by Prof. W. H. Brittain, Truro, N.S.; "The Entomological Record for 1917," by Mr. Arthur Gibson, Ottawa. This latter paper of 24 pages gives a large number of new distributional records from the various provinces.

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[*] Reviewed by W. S., Auk, XXXV, No. 5, July, 1918, p. 367.

OBITUARY NOTICE.

CHARLES K. DODGE.

Canada lost one of her best botanists when Mr. Charles K. Dodge died recently at Ann Arbor, Mich., for although living at Port Huron, Mich., much of his field work in botany was done in Canada. His botanical work is an unanswerable reply to those who think that busy men have no time for scientific work. For many years a U.S. Customs official, every holiday and every spare hour during the summer months were spent in collecting and studying plants, the country on both sides of the St. Clair river giving him a rich field for study close to his home. In recent years his holidays were spent working in conjunction with the Michigan Biological Survey. No other botanist knew the flora of Michigan as he did and certainly no Canadian botanist has given the same study to the adjacent parts of Ontario. Mr. Dodge published many notes and papers on his work in Ontario the most important being an "Annotated List of Flowering Plants and Ferns of Point Pelee, Ont., and Neighbouring Districts," published by the Geological Survey of Canada as Memoir No. 54.—J. M. M.

THE OTTAWA NATURALIST

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A LIST OF THE TURTLES, SNAKES AND BATRACHIANS OF MANITOBA.*

By Ernest Thompson Seton.

THE PRAIRIE MUD TURTLE OR PAINTED TURTLE, *Chrysemys marginata bellii* (Gray).

This is the common turtle of Manitoba. It is a small inoffensive species, readily recognized by its size (about 4½ inches along the back—115 mm.), the bright red spots on the edge of its shell and the dark irregular blotch or cloud on the plastron, which last most readily distinguishes it from its near relative, the Eastern Mud Turtle.

I found it rather common in the Red river, near Winnipeg, and about Carberry in the large ponds and streams. It is also reported from many points in the prairie region—Boissevain, (A. S. Barton); Riding Mountain, (C. C. Helliwell); Austin, (Dr. Shaw).

Evidently, it is of general distribution in the south-west quarter of Manitoba, but is unknown at Shoal Lake or anywhere on the east side of Lake Manitoba. Richardson records it occurring at the south end of Lake Winnipeg and gives "Asaté" as its Chippewa name.

There is no available information on its breeding habits, but the female of the kindred species *picta* lays eggs during June, in a dry sunny bank, often remote from water. The eggs are white, leathery and nearly round; they measure about one inch (26 mm.) through, and number about half-a-dozen. All the eggs of the season are laid at one time and hidden in a single hole. This hole is three or four inches deep, scooped out by the hind feet of the mother; the eggs are left in several layers and covered with earth and leaves, so carefully as to be difficult of detection. The mother takes no further interest in the nest. The young hatch out after two weeks, crawl to the nearest swamp, and shift for themselves.

"The process of reproduction by laying is not commenced before the eleventh year . . . . enough has been seen to warrant the assumption that from the eleventh to the fourteenth year is about the age at which most, if not all our native fresh water turtles lay their eggs for the first time; . . . . not one of our turtles makes more than a single nest [each year]. They deposit all the eggs at once. The Painted Turtle has an almost identical period of incubation with the Snapping Turtle, namely, from the 11th to the 25th of June." [L. Agassiz, on Painted Turtle, 1857].

To this, Professor H. A. Surface adds (Turtles of Penna. 1908, p. 149): "The Painted Turtle is known to lay only from five to seven eggs a year, although more may be found within the body at any time. These do not all come to maturity during the same year."

The eggs are much preyed upon by skunks, raccoons, gray squirrels, etc., which search them out and devour them with keen relish.

The natural food of the turtle is insects, worms and fish, but it is known to add fruit and leaves to its diet.

In the autumn, it buries itself in the mud, at the bottom of a pond, below the frost line, and remains torpid till the following May.

The first sharp frost at Cos Cob, Connecticut, came about the beginning of December (?) one year. There was no snow; the ice was very clear; looking through it I saw on the bottom of the lake in three feet of water 20 or 30 Painted Turtles slowly crawling in one direction; that is, toward the inlet of the lake. They were not apparently associated.

The reappearance of the Mud Turtle is a sign of spring at its flood; but the Scriptural line, alluding to the "voice of the turtle in our land," refers not to

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*The nomenclature is that of Stejneger and Barbour's Check-List of N. A. Batrach. and Reptiles, 1917.

Acknowledgment is here made of kind assistance given by Karl P. Schmidt of Am. Mus. Nat. Hist., New York.

this, but to the turtle dove; the Mud Turtle is believed to be mute, except for the slight hiss it utters on retiring into its shell.

SNAPPING TURTLE OR SNAPPER, *Chelydra serpentina* (Linn).

In 1848, Richardson wrote: "As a contribution to what is known of the geographical distribution of reptiles, on the east side of the Rocky Mountains, frogs may be set down as attaining the 68th parallel of latitude; snakes as reaching the 56th; and tortoises as disappearing beyond the 51st, at the south end of Lake Winnipeg. There the *Emys geographica* of Le Seur [probably this refers to the preceding *C. m. bellii*] named Asaté by the Chippeways, occurs; and also, one with a flexible neck, called by the same people, *Miskinnah*, which is probably the Snapping Turtle." (Arc. Search. Expd. 1851. Vol. I., p. 204).

The first and only Snapper I ever saw in Manitoba, was taken in the Assiniboine, near the Little Souris, in 1896, by John S. Charleson (now in possession of John Riddington, of Winnipeg). It was 30 inches long; the shell 12 inches long and 11½ inches wide. I have heard of several specimens taken near Winnipeg, but the species must be considered rare in Manitoba; for this we should be thankful, for it is a ferocious reptile of great strength and insatiable appetite. It preys on fish, ducks, goslings, and, indeed, all aquatic animals big enough for its food and smaller than itself. I have seen this turtle take down a full-grown duck, seizing it by the legs from below; and, as an ordinary Snapper weighs ten or fifteen pounds, the duck, one-quarter his weight, has no chance of escape.

The nest of this turtle is much like that of the foregoing, but its eggs are larger and less round, and more numerous, as those of a single nest often number as high as two dozen.

In the latter part of August, 1917, a pile of building-sand was dumped about 100 feet from the lake on my land at Greenwich, Connecticut. Next morning, we found six good-sized Snappers on it. They were each about six or eight pounds in weight. We found no eggs and could see no reason for their congregating there, or how they all found it so quickly.

The Snapper is of very slow growth. The enormous specimens sometimes found are undoubtedly of great age.

COMMON GARTERSNAKE, *Thamnophis sirtalis parietalis* (Say).

This Gartersnake is found at least throughout the southern half of Manitoba. I expect to find it in every part of the province, for Preble found it common about Edmonton, Alta. (N. A. Fauna No. 27, p. 500). I got two specimens in the Salt River County, near Great Slave river; and Richardson records it north to lat. 56, near Isle a la Grosse, Arctic Search. Exp., Vol. I., p. 98. In a footnote, p. 204, ibid, he records the killing of a snake on "Porcupine river far within the Arctic Circle." It is readily recognized by the two black stripes separated by green, that run the whole length of its body.

It is about two feet long when fully grown, but specimens over thirty inches long have been found. Though a small snake, it is the largest of those that have hitherto been found in the province.

It is perfectly harmless, and its usual prey is frogs, minnows and insects.

Near Carberry, I once heard a loud squealing, in a marsh. On going near, I saw a frog with a Gartersnake holding to its hind legs. The frog was kicking with the other leg and, at the same time, clinging to a tuft of grass with his arms and squealing lustily. According to the laws of the chase, he belonged to the Gartersnake; but the ancient quarrel of man and the snake put me on the side of the frog, and I saved his life.

When camping at Lake Winnipegosis in 1904, I was warned not to go near Snake Island, as it was "swarming with all kinds of venomous snakes." That was enough; I made straight for Snake Island, and camped there a day-and-a-half, with my friend E. W. Darbey, but saw only four harmless Gartersnakes. When we left the place, and were over two miles away, we found in the water two snakes swimming toward the island. They seemed perfectly at home in the water, and I doubt not the rocky cliffs of the island furnish attractive winter dens that bring many snakes from their summer range in the far-reaching marshy shores of the adjoining parts of Lake Winnipegosis.

There are several places in the province that are, or were, noted for their vast congregations of Gartersnakes, one of the most famous being that at Stony Mountain. These places are usually high, dry, rocky dens, surrounded by a region of swamps; the latter furnish the snakes with a congenial summer range, and the former a dry denning place for hibernation.

There is no doubt that Stony Mountain was an island at one stage of the ancient Lake Agassiz; as the lake grew shallow and marshy, the snakes would increase. The island became a natural gathering-place, and the annual resort thither of the snakes *en masse* to-day is, possibly, an instinctive local migration, established in those remote times.

In the early fall of 1881 or 1882, I am told, there was a general and fierce prairie fire between Winnipeg and Stony Mountain. After it, thousands of snakes were found dead on the prairies; all, apparently, headed for Stony Mountain. In spite of this destruction, thousands of Gartersnakes were yet to be seen at Stony Mountain and Balmoral, till they were destroyed for nuisances, although all were of the same harmless, even beneficent, species.

In June, 1902, at Shoal Lake, I got a female Gartersnake with 26 eggs ready for hatching; they were in one column of 21 and a short parallel column of 5. The stomach of this snake was examined by Dr. S. D. Judd, of the Biological Survey, Washington, D.C. He reported its contents as follows:—"Hind legs and pieces of stomach of *Rana pipiens*, one *Agonoderus pallipes* and another small carabid beetle, one tenebrionid beetle, one caterpillar *(Agrotis)*, two flies, one ichneumon fly (Hymenoptera), one aculeate hymenopter (*Pompilus*), eight spiders, one ragweed (*Ambrosia*), two seeds of *Polygonum*. The insects were in a finely comminuted state." Whether they were originally swallowed by the frog or the snake is not clear. A case in which the tables were turned, so that a small Gartersnake was even devoured by a Wood-frog is recorded by John J. Schoonhoven, in *Guide to Nature*, April, 1910, p. 400.

In late summer, as with all Gartersnakes, the young of the species are born alive. According to H. A. Surface (Serpents of Penna. 1906, p. 145), the young in Pennsylvania are born between July 25th and August 25th. The mother "lives near the young and guards them during the fall. They pass the winter in rubbish, in the earth, beneath stones, or in hollow logs; and in spring the young shift for themselves."

THE PLAINS GARTERSNAKE, *Thamnophis radix* (Baird and Gerard).

This species is much like *sirtalis;* but it has the light side-stripes on the third and fourth row of scales; whereas, *sirtalis* has them on the second and third.

A specimen that I took at Carberry, in 1883, was identified by Dr. J. H. Garnier as *radix*. Donald Gunn took another at Lake Winnipeg.

Dr. Stejneger gave this name to one I sent him from Winnipeg; and Dr. E. Coues reported it along the boundary at Pembina, Turtle Mountain and Souris River; so that it is probably of general distribution in southwestern or prairie Manitoba.

THE GREEN-SNAKE OR GRASS-SNAKE, *Liopeltis vernalis* (Harlan).

This brilliant little creature is abundant along the Assiniboine river, south of Carberry. During August, Green-snakes can be seen in numbers where the hot, sunny banks of the river valley rise near any grassy thickets, affording basking-places near coverts of safety. It is also reported from Winnipeg and Shoal Lake and Boissevain. Unfortunately, its exquisite green is lost in alcohol, being replaced very soon by a pale-blue. The species is perfectly harmless.

An individual that I caught on the banks of the Assiniboine, July 14, 1884, and kept captive at Carberry, produced six eggs on July 27th; it refused all food and died July 31st.

RED-BELLIED SNAKE OR COPPER SNAKE, *Storeria occipto-maculata* (Storer).

This species is rare, compared with the foregoing. I had heard of it several times before seeing it or securing a specimen. The one in my collection was captured at Carberry by Frank Dickie, in 1904; and it has been observed occasionally as far north as Shoal Lake. A. S. Barton reports it rare at Boissevain; but John S. Charleson says it is common at Blythe, near Little Souris river. Like the other snakes found in Manitoba, this species is perfectly harmless. Its food is chiefly insects, and its range seems to be the south-western part of the province.

MUD-PUPPY OR SPOTTED SALAMANDER, *Necturus maculosus* (Rafinesque).

The two specimens in my collection were taken by E. W. Darbey at Winnipeg.

WATER-LIZARD OR PRAIRIE SALAMANDER, *Ambystoma tigrinum* (Green).

This species is generally distributed in south-western Manitoba, that is, all the prairie region. It is not a lizard at all, but a cousin to the frogs. It is well-known in two different stages; first, as a big, soft water-creature in the ponds and in the ditches along the railways; second, as a yellow-and-black spotted land-animal like a lizard; but it is not generally known that these are one and the same animal; the Water-lizard being the tadpole stage, the land-animal is the stage corresponding with the frog.

It is a remarkable fact that the species occasionally breeds in the tadpole as well as the adult stage.

In the autumn, when they are seeking a winter den, the crawlers are found in cellars and post-holes in numbers. I found them exceedingly numerous at Boissevain in September, 1904. I have several times found them in gopher holes where they had denned up for the winter. Notwithstanding their appearance, they are perfectly harmless

WOODLAND SALAMANDER, *Ambystoma jeffersonianum* (Green).

Among some alcoholic specimens sent me from Beausejour, Whitemouth river, eastern Manitoba, by Walter Sidebottom, was an example of this species, the only one I know of taken in the province, although the species should be found in most of the wooded regions. It was identified by Dr. L. Stejneger. The specimen is now in the American Museum, New York.

LEOPARD-FROG OR SPOTTED GREEN-FROG, *Rana pipiens* Schreber.

This is the common frog of Manitoba. I found it abundant at Winnipeg, Lower Fort Garry, Selkirk, Shoal Lake, Lake Winnipegosis, Carberry, Brandon, Whitewater Lake and Boissevain; Preble reports it from Norway House (N. A. Fauna No. 22, p. 133.) It is, doubtless, found throughout the province.

It is readily distinguished by the conspicuous black spots outlined in white with which its green skin is decorated.

On June 16, 1888, near Toronto, I killed a common Gartersnake. It had in its stomach a frog which had in its stomach a potato beetle and a large water shell.

W. L. Hine related to me a curious incident:—"One day," says he, "when out collecting, I shot a goldfinch. I marked it down, and, though there was little cover, I could not find it. A large green frog was hopping away from the place, and I saw something sticking from its mouth. This, on closer view, proved to be the legs and wings of the goldfinch. I recovered the specimen, but it was spoiled. Many specimens of small birds mysteriously disappear when shot near frog ponds; and I doubt not that the above contains the explanation."

Like most of the frogs, it winters deep in the mud, though not necessarily under water.

WOOD-FROG, *Rana cantabrigensis cantabrigensis* (Baird).

This small frog is much less abundant than the preceding. I found it at Winnipeg, Lower Fort Garry, Selkirk, Shoal Lake and Carberry. Preble found it at Norway House, Playground Lake, York Factory and Fort Churchill (N.A.F. 22, p. 133), and notes it as the common frog of the Mackenzie River Basin (N.A.F. No. 27, p. 501). He calls it *latiremis*.

It is easily distinguished by the absence of conspicuous spots, except the broad black bar along the cheek. It is found in the woods, often far from water; in the early spring it makes the ponds resound with its short, harsh, quacking notes.

In late July, 1918, at my country home, Greenwich, Connecticut, four deep post-holes were dug for a fence and left open some weeks. During the last of July, or perhaps the first week of August, the Wood-frogs were performing their usual overland migration away from the water. About a score or more fell into each of the holes. During August I was away, but I returned in mid-September. The frogs were still hopping about in the holes, but hopelessly imprisoned. I now set them free; all seemed fat and lively; yet apparently all had been without food or water for six or seven weeks. With them were one or two Toads, also some beetles and a berry-bug.

NORTHERN OR MINK FROG, *Rana septentrionalis* Baird.

Recorded by Kennicott as taken at Selkirk Settlement. So called because it smells like a mink.

BULL-FROG. (?) *Rana catesbeiana* Shaw.

This has been reported to me from the Red River Valley, but I have not seen specimens, and enter it with a question.

In my Connecticut home I have seen great numbers of tadpoles of the Bullfrog, all winter long, in the ice, and washed up on the ice during January freshets. As they were strictly in tadpole stage, this illustrates the fact that they are two years in maturing.

The following interesting note on the age of Bullfrogs appears in the *Guide to Nature* for November, 1910, p. 277, quoted from *Brooklyn Museum News*:

"Our two Bullfrogs, *Rana catesbeiana*, after having been in captivity for eight years, died in August. Frequent mention of these frogs have been made in previous numbers of the *Museum News*, but as little seems to be known concerning the age of Bullfrogs, it may be worth while to record the following data: The frogs came to us from Elmhurst, L.I., in the summer of 1902, when fully grown. The male measured 12.6 inches and the female 14.4 inches total length. Three days before death the male weighed 15 ozs., and the female 25 ozs. Allowing two years for the tadpole stage and 3 years for the growth as frogs, our two captives must have been at least 13 years old, counting from the egg state. Under natural and favorable conditions, it seems possible that Bullfrogs live from 15 to 20 years."

SPRING PEEPER OR HYLA, *Hyla crucifer* Wied.

According to Stejneger and Barbour, this well-known pond whistler ranges from New Brunswick to Manitoba; therefore, it is listed here, although I do not know of any specimens taken in the province.

NORTHERN SPRING PEEPER, PEEPER FROG, OR SWAMP WHISTLER, *Pseudacris triseriata* (Wied).

This tiny frog, an inch long from nose to stern when full grown, is abundant in all places of the province where I have collected in summer; that is, Winnipeg, Lower Fort Garry, Selkirk, Shoal Lake, Carberry and Boissevain. As, according to Preble, it is distributed northwest to York Factory and Great Bear Lake (N.A.F. No. 22, p. 134), it is to be looked for in all parts of Manitoba.

The *crucifer* is easily recognized by the dark St. Andrew's cross on its back; whereas, the *septentrionalis* has only a number of long blotches or stripes.

Though its piercing "*prreep prreep*," from the chilly pond, in early springtime is familiar to all, very few have seen the originator of the noise or know that it is a tiny frog that makes this small steam-whistle. While uttering it, his throat is blown out like a transparent bladder and is nearly as big as himself At Shoal Lake, in 1901, I found them still singing in the first week of July. The note is more rattled than that of *H. crucifer*. The Peeper is in full song about the first of May; they are very abundant; sometimes there are hundreds of them singing in one pond, with their noses above water; and yet, any one who succeeds in seeing one while it sings may congratulate himself upon having achieved a difficult exploit in woodcraft.

A specimen that I took at Lower Fort Garry, August 22, 1904, was a brilliant grass-green on all its upper surface; but this, Dr. Stejneger said, was merely an individual variation.

COMMON TOAD,
Bufo hemiophrys (Cope).

The Common Toad is abundant everywhere from Winnipeg and Shoal Lake to Brandon, from Boissevain to Winnipegosis, and, probably, throughout the province. Its spring note is a soft trilling, uttered about twice a minute and lasting about three seconds each time.

An interesting article on the homing power of the Common Toad appears in *Guide to Nature* (Oct., 1918, p. 142). The writer, F. H. Sidney, mentions instances of marked Toads returning to their home places from distances of 3 to 10 miles, to which they had been carried; and doing this within a few days.

AN OTTAWA BEACH OF THE CHAMPLAIN SEA.

By E. M. Kindle.

INTRODUCTION.

Before the advent of the science of geology men lived in what was supposed to be a completed or dead world. Except for the waggon ruts in the roads and a few other minor alterations by man the earth was believed to have been created, just as we see it, a few thousand years ago. Historical geology has enabled us to peer "far back into the night of time." In place of the finished world of a few generations ago we now recognize a constantly changing world which has been tenanted by an endless succession of plants and animals, each unlike and a little in advance of those which preceded it. The geography of to-day we now know to be no more permanent than the cloud forms of yesterday. Familiarity with geological concepts has contributed enormously to mobility of mind and broad intellectual hospitality. The man who can visualize clearly the physical geography of eastern Canada as it was some ten thousand years ago is prepared to comprehend as well as to meet and direct the great changes incident to the evolution of the social, economic, and political world in a way that his brother who still lives in the finished world of yesterday cannot. It is perhaps something more than a coincidence that the science of geology and the principles of political liberty first took root in England.

In the light of these considerations it should be clear to the non-professional reader that historical geology has a broad cultural value which will well repay one for the trouble of acquainting himself with the salient features of his local geological environment. There are few localities where the recent chapters in the geological history of the continent can be more easily read than in the Ottawa district. This is because the Ottawa and St. Lawrence valleys were invaded by the sea at a very recent period, geologically speaking,—perhaps not more than 10,000 years ago.

AN ANCIENT SEA BEACH.

The deposits of the latest marine invasion of the Ottawa valley are of two distinct types, fine textured blue clay and beds of sand. The sand deposits, which are widely distributed throughout the Ottawa river valley, represent, frequently and perhaps generally, deposits of an ancient sea shore. These beaches are not of the type which the reader may have seen at Cape Anne or some other rock bound part of the exposed Atlantic coast where a ridge of granity boulders six or eight feet high shows unmistakably the border of the sea and the prowess of its waves. The beaches of the arm of the Champlain or Pleistocene sea, which invaded the Ottawa and St. Lawrence valleys shortly after the retreat of the glaciers from the region, are comparable with those of the Bay of Fundy, where the strand line is generally defined by the margins of broad nearly flat stretches of sand or mud. Across these broad intertidal belts the sea in many places retreats for miles at the turn of the tide, leaving nothing to mark its maximum landward extent beyond the margin of the tide-borne sand or mud.

Here and there in the Ottawa valley, where they have escaped erosion, we find vestiges of the old sea beaches and the life which flourished on them. Southwest of Ottawa, six miles, the Rideau river has cut into one of these old Pleistocene beaches at a locality a few hundred yards below the Black rapids. The work of the river, combined with the extensive excavation of sand for use in the City of Ottawa, has furnished an excellent section of the old beach sands (fig. 1). The removal of this old beach deposit by the river began immediately after the birth of the Rideau and Ottawa rivers, an event which followed directly on the retreat of the sea from the region. This surviving remnant of the old beach can therefore give but an imperfect conception of the original extent and outline of the old sea shore.

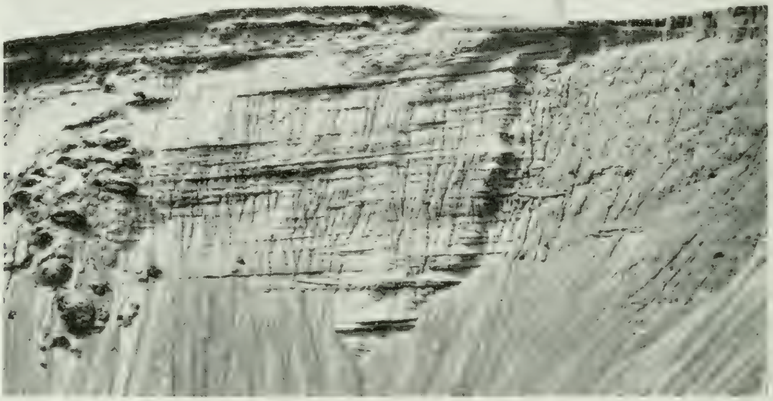

Fig 1.—Face of sand pit, near Rideau Junction, Ont. These sands represent a shallow water deposit of the Champlain sea.

If the visitor to this interesting locality should approach it by way of the charming canoe route up the Rideau canal and river he will pass, at the picturesque Hogs Back rapids, extensive exposures of Ordovician limestone,—the product of another long extinct sea which compares in age with the sand pit deposits very much as the Pyramids do with the Ottawa Union station. In contrast with the limestones of the Ordovician, whose age we estimate in millions instead of thousands of years, the sands of the Rideau pits may with propriety be referred to as representing a sea beach of yesterday.

The face of the sand pit, which is kept nearly vertical by constant removal of sand, exposes about 60 feet of clean quartz sand. The sand furnishes in its cross bedding evidence of the wave and current action which characterizes most beach deposits. (fig. 1). From the top of the pit the surface of the sand stretches away toward the east as an approximately level surface. Except for slight irregularities represented by a few low dunes and a very moderate amount of reduction by erosion, the surface of this sand plain shows about the same topographic contour which it had as a beach or bar in the shallow waters of the Pleistocene sea.

The location of Ottawa, more than 200 miles from the nearest salt water, in a region where lakes are common, might lead the intelligent layman to enquire what evidence there is for calling this deposit of clean washed sand a sea deposit rather than a lake beach formation. And if it is of marine origin, he may ask what proof can be offered of the shallow water origin which its reference to a sea beach implies. The answer to both of these questions is found in the fossil fauna which the sand beds hold.

THE FAUNA.

Some of the upper beds of the sand pit hold a great abundance of marine shells. All of these belong to species now living in the Gulf of St. Lawrence and thus attest the comparatively recent withdrawal of the sea from the Ottawa river valley. (fig. 2). The following species have been collected by the writer: *Mytilus edulus*, *Macoma bathica*, *Saxicava rugosa*, *Balanus* sp.

Perhaps the most interesting and significant species in this list is *Mytilus edulus*. The shell is abundant nearly everywhere on our present Atlantic coast, at or a little above low water. But it is seldom found in water of any depth. Exposure to the air between tides appears to be as essential to the vigorous growth of this shell as it would be fatal to the majority of shells. The presence of *M. edulus* in these beds in abundance thus affords evidence of their origin in very shallow water. *Macoma bathica* is also a shallow water species occurring according to Whiteaves "usually at or a little below low water mark." The presence of *Saxicava rugosa* in the fauna has but little significance regarding the depth of water in which the fauna lived since this species is now found living in Canadian waters from low tide level to a depth of 50 feet. Temperature appears to be the chief factor which controls the vertical distribution of this shell. While it is never found in very shallow water in the Gulf of St. Lawrence, in Arctic and sub-Arctic waters it has been found living near low tide level. The association of this cold water-loving shell with such a typically intertidal species as *M. edulus* suggests colder climatic conditions, since water sufficiently shallow to be a satisfactory habitat for *M. edulus* in our present climate would have too high a temperature to accommodate *S. rugosa.*

A noteworthy feature of this fauna is the absence from it of most of the shells which are most common in the fossil fauna found in the widely distributed Pleistocene blue clay. The blue clay fauna represents species which were contemporaneous with the fauna of the sand beds but which occupied a different bathymetric zone—relatively deeper as well as distinctly different in the character of the bottom materials. The species most commonly met with in the clay-beds include the following shells: *Portlandica arctica, Saxicava rugosa, Macoma calcarea,* and *Nucula tenuis.*

The collector of fossils is often puzzled by the very marked contrast in the relative abundance of fossils which the same type of sediments display at different localities. While the marine sands may be extremely rich in sea shells at certain localities like the Rideau river sand pits they may at other localities be entirely barren of fossils. One of the reasons for such barren areas is doubtless the tendency of sands to move rapidly under current action and smother the marine life which attempts to live on them. Dr. G. A. Huntsman who has been engaged in studying the conditions under which marine animals live in the Gulf of St. Lawrence has directed attention to another factor in producing lifeless zones. He states*:

"By means of these traps we discovered that a barren zone existed off the Cape Breton shore, comprising the part of the sloping bottom between the depths of 10 and 20 fathoms. In this zone the temperature at the bottom underwent violent fluctuations often in the course of a day or so, at one time being as high as 65° F., and at another as low as 39° F. This was caused by the winds for when the wind was blowing on shore it drove the surface water against the coast and heaped it up, forcing the deeper colder water down, then when it changed and blew off-shore the warm surface water was driven away from the coast and the cold water welled up from below to take its place and so flooded the zone. The effect of this on the slow moving bottom animals may be imagined. Few of them would be able to stand such changes, but the active fishes are able to move up and down the slope and avoid these changes."

It is probable that we can safely ascribe to the variable temperature factor some of the paucity of life which in many places characterizes the Pleistocene clays as well as the sands of the Ottawa valley.

THE INSTABILITY OF SHORE-LINES.

The advance or retreat of shore-lines results from two distinct causes. Elevation or subsidence of the land through the action of deep-seated forces within the earth is a very slowly acting but potent agent in changing geographical features. The second great factor in making new shore lines is the sea itself which is everywhere either cutting away or adding to existing shore lines. The rapidity of this constructive and destructive work of the sea varies enormously according to the hardness of the rocks and the behaviour of waves and currents, as well as the topography of the shore.

Everywhere along the Atlantic coast of America the first named factor has wrought enormous changes in the shore line since the close of the Glacial epoch. A profound subsidence of the land in eastern America which accompanied or followed the disappearance of the glacial ice sheet brought the sea far inland along all the great valleys leading to the sea coast (fig. 2). At one time during this marine invasion it has been estimated that the sea was at least 200 feet deep over Parliament hill. The re-elevation of the land and withdrawal of the sea in eastern Canada and New England was the last great geological event of the Pleistocene epoch.

Elevation or subsidence of the land, although the most powerful factor in producing the major features of coastal geography operates with extreme slowness and is subject to long periods of inactivity, while the sea in revising its boundary never ceases work for a single year. Enormous changes are sometimes wrought in a very short period where the shore line is composed of sand or clay. Sable island off the east coast of Nova Scotia furnishes some striking examples of the rapid changes which a coast line may undergo. Hon. Joseph Howe a number of years ago reported that by actual measurement 11 miles of the west end of the island had disappeared in 30 years. The commodious harbour on Sable island which was formerly a favorite haven of safety for fishing vessels was closed by a gale in 1836 shutting in two American vessels whose ribs are now buried in the sand.

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*Canadian Fisherman, May, 1917.

On parts of the south coast of England the work of the sea is largely constructive. Some of the towns on the coast which were located on the sea shore in the days of the early English kings, are now one or more miles inland. During storms from the south-west the waves and currents drive enormous quantities of shingle and gravel onto this coast, often making it difficult or impossible to keep the harbours open. At the Port of Dover it was long the custom for the Mayor to summon with a drum, by day or night, all the householders in the city to the harbour to shovel shingle whenever it was endangered by the influx of shingle drift.

Facts like these had been observed long before the development of modern science. Some of the more reflective minds of the Middle ages were deeply impressed by them. Mohammed Kaswini an Arab writer of the 13th century had at that early period felt the spell of the mighty past of geological time. His impressions were put into allegorical form. They are given in the following narrative of Kidhz, an allegorical personage: "I passed one day by a very ancient and wonderfully populous city and asked one of its inhabitants how long it had been founded. It is indeed a mighty city, replied he, we know not how long it has existed, and our ancestors were on this subject as ignorant as ourselves. Five centuries afterwards as I passed by the same place I could not perceive the slightest vestige of the city. I demanded of a peasant who was gathering herbs upon its former site, how long it had been destroyed. In sooth a strange question, replied he, the ground here has never been different from what you now behold it. Was there not of old, said I, a splendid city here? Never, he answered, so far as we have seen and never did our fathers speak to us of any such. On my return there five hundred years afterwards I found the sea in the same place and on its shores were a party of fishermen of whom I inquired how long the land had been covered by the waters. Is this a question said they for a man like you? This spot has always been what it is now. I again returned five hundred years afterwards and the sea had disappeared. I inquired of a man who stood alone upon the spot how long ago this change had taken place; and he gave me the same answer as I had received before. Lastly, on coming again, after an equal lapse of time, I found there a flourishing city more populous and more rich in beautiful buildings than the city I had seen the first time; and when I would fain have informed myself concerning its origin, the inhabitants answered me, Its rise is lost in remote antiquity; we are ignorant how long it has existed, and our fathers were on this subject as ignorant as ourselves."

This allegory of the old Arab writer was doubtless inspired by finding somewhere fossil sea shells representing, like those of the Rideau sand pits, a long vanished sea. In this ancient story we can discern a glimmer of the dawn of the science of historical geology.

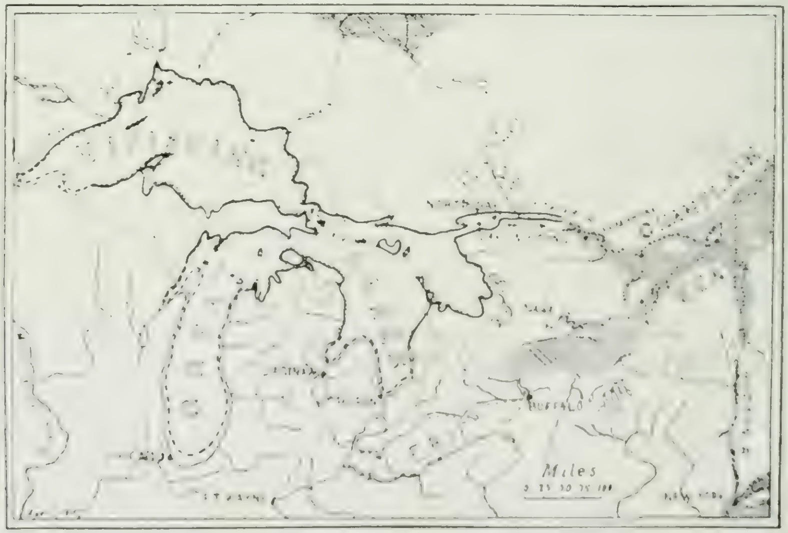

Fig 2. The Champlain submergence. The shaded portion of the map indicates the extent of this invasion of the sea. (After F. Taylor).

OUR CANADIAN NUT TREES.

By F. E. Buck, Ottawa.

The nut trees of Canada belong to two families. The walnuts and hickories belong to the Walnut Family and the chestnuts, hazelnuts, beechnuts and oaks to the Beech Family. They vary in size from the shrub-like hazel to the stately hickories. One peculiarity of most of the nut trees is that the small branches dip down and then grow up again. The walnuts, when growing as single specimens, form roundish or triangular shaped crowns and frequently stand out as land marks in old pastures and rocky fields. Both walnuts and hickories, when growing with other species in the woods become modified in form, generally growing taller with a much smaller crown.

The heights which are given in the following descriptions relate to specimens growing throughout Canada, but as we go south into the United States these measurements, in most cases, must be increased.

Nut trees are valuable for their wood and for their fruit. The United States has a considerable import trade with nuts and 1910 figures give the total value of imported nuts at thirteen million dollars, or in quantity, one hundred and fifteen million pounds. This does not, of course, take into consideration the very considerable quantity of home-grown nuts. The food value of nut trees, therefore, must be looked upon as already considerable and of growing importance.

The Wood.

Nearly all of the nut trees produce a very hard quality of timber and, in the case of black walnut, much of it is used for fine cabinet work and for high-class furniture. Owing to its popularity in that connection it now has an almost prohibitive price. The wood of the butternut is somewhat softer and lighter in weight. It is used for boat building and interior finish work. The wood of the various species of hickories is very similar and is seldom separated on the market. It is amongst the hardest, toughest and strongest of the timbers of commerce. In Canada it is used chiefly for vehicle stock, tool handles, agricultural implements, machinery parts and sporting goods. Chestnut wood is highly prized for the manufacture of tanning extracts and also for fence posts because of its durability in contact with the soil.

The Fruit.

The following brief descriptions of the fruit of the most important nut trees may be interesting:—

BLACK WALNUT. Nut almost round, about one inch in diameter or smaller. Shell hard, black, cut with deep ridges. Husk blackish with an aromatic odour. Kernel oily, sweet and edible. A marketable nut.

BUTTERNUT. Nut oblong, pointed at one end, two or three inches long. Shell deeply furrowed with many sharp irregular ridges. Husk brown and very sticky. Kernel good flavor anl edible.

HICKORIES. (1) The Bitternut hickory has a very bitter kernel with a thin shell and thin husk. (2) The Shagbark has a nut which is compressed laterally and is four-ridged. The kernel is sweet and edible and is of greater commercial value than that of any of the other hickories. (3) The Mockernut has a very thick shell and the nut is large. The husk is also hard and thick. The kernel is sweet but small and difficult to extract. (4) The Pignut produces nuts which vary in size and in shape. The kernel is bitter or sweet. The husk of the hickories split into four sections as the nuts ripen.

CHESTNUT. The fruit of the chestnut is contained in a spiney burr which holds one to three shiny, brown, thin-shelled, sweet, edible nuts. The burrs split open as the nuts ripen. The native nuts are much smaller than those of the European species.

HAZELNUT. The fruit, which is a small nut about one-half inch long, is enclosed within a pair of broad, leafy, cut-toothed bracts. It is chestnut brown in color and almost globular in shape. The fruit of the beaked hazelnut is ovoid in shape and is enclosed in a leafy covering terminating in a long tubular beak.

HORSE CHESTNUT. The nut of the horse chestnut is not edible. It is large, varying from one to one and one-half inches in diameter, contained singly within a smooth pod covered with soft spines. The nut itself is aromatic and bitter narcotic.

The Food Value of Nuts.

Nuts have an important food value on account of the large percentage of protein and oil which they contain. It is for this reason that they are recommended for diabetics, except perhaps the chestnut which is the only one which also contains a considerable percentage of starch.

Nuts are used also in very large quantities in commercial work, especially by confectioners. They are used for making candies of all kinds and in the icing on various cakes, etc. Nuts are also used in salads. The flavor of nuts depends upon the oil. All nuts are rich in mineral matter and contain, on the average, about two per cent of mineral substances.

In the cracking of nuts it should be remembered that the hickory nut can be cracked most easily by applying pressure or force to the thin side of the nut, while the butternuts and walnuts can be cracked by applying pressure to the end. If this is remembered the nuts will crack along certain definite lines without injuring the kernel to any extent. At the present time nuts are not expensive as an article of diet because they supply a large amount of energy at a reasonable price per unit. They constitute a very concentrated form of food, even more so than cheese.

The English walnut is also used for pickles, catsups and preserves, and in France many tons a year are made into oil which is used as a substitute for olive oil.

THE MOST VALUABLE NUT TREE.

The Persian or English walnut is, without doubt, the most important nut tree from the commercial standpoint and as this will thrive in many parts of British Columbia, as well as in certain parts of southern Ontario, it will be of interest to call special attention to some interesting facts about this important variety. At the present time Canada and the United States import more dollars' worth of the English walnut than both these countries export in apples. There is little reason why this should be as the nut could be grown on this continent with considerable success. It is perhaps the finest flavored of all the nuts. It was called by the Romans, the nut of the gods, and trees distributed by the Romans throughout southern Europe have left descendants behind which are now over 1,000 years old. One tree has been known to produce as many as 100,000 nuts in a single year, and the value of the wood of a single tree has been known to exceed $3,000.00. The English walnut was first introduced into America about the year 1758, and is grown commercially chiefly in the state of California, where about 12,000 tons are produced. It is possible, however, that trees would do even better in British Columbia than in California, as it succeeds well in almost every section of England. Frosts in the early autumn are an advantage as they induce the outer shucks to crack and release the nuts. The harvesting then becomes a very simple matter.

The Experimental Farm at Agassiz, B.C., has grown, since its formation, many of the varieties of nuts with complete success.

THE WALNUTS.

There are about ten known species of walnut widely scattered throughout the four continents. Four are native to North America and two of them are also found in Canada. The Black Walnut is found in Ontario, south to a little north of Ottawa, and the Butternut from the lakes southeast to the coast. In addition, the Japanese Walnut is hardy at Ottawa and in the southern parts of Canada from coast to coast, while the Persian or English Walnut thrives in British Columbia, but winter kills to the snow line at Ottawa.

THE BLACK WALNUT, *Juglans nigra.* This tree, growing in the open under favorable conditions, attains a height of from 50 to 90 feet with a diameter from 2 to 5 feet. In the forest, however, it grows differently; the trunk is tall and columnar, the head narrow and rigid instead of the rounded crown of the field specimens.

It requires a deep, rich, well-drained loam to do well. At Ottawa trees growing in the Forest Belts in poor and unsuitable soil have made poor growth. In thirty years they made a growth of only 16 feet with a 3-inch diameter when planted in low sandy loam, and a maximum of 24 feet and 4 inches in diameter when planted in a better type of soil. The tree occurs naturally in Canada only in southern Ontario where it is a fairly fast grower and is tolerant of shade. It might be mistaken for the Butternut except that its bark is darker. The buds are smaller than those of the Butternut, while the compound leaves consist of fifteen to twenty-three leaflets.

BUTTERNUT, *Juglans cinerea.* This tree is found throughout the hardwood region of Ontario and east to New Brunswick, growing at its best in well-drained loam solitary or in small groups with other trees. The single specimens grow from 40 to 50 feet high and from 1 to 3 feet in diameter. The crown is roundish to triangular-shaped. At Ottawa single specimens become medium-sized trees about 30 feet high, but those in the Forest Belts, growing in poor soil, have made an average growth of only 13 feet in thirty years. The bark is light gray and the ridges smooth-topped. The leaflets are from nine to seventeen to a leaf.

JAPANESE WALNUT, *Juglans Sieboldiana.* This walnut is hardy at Ottawa where probably some of the oldest trees of the species are to be seen. Native to Japan it was not introduced into Europe until about 1860 by Siebold. Its nuts are edible and sweet and are valued as food in Japan. It becomes a tree of about 50 feet in height, with leaves about two feet long, composed of eleven to seventeen leaflets. It may gain in value as a commercial tree after it has been more widely distributed.

ENGLISH WALNUT, *Juglans regia.* In a former paragraph a fuller description of this tree is given and it is not necessary to do more than mention it here. As a tree it grows from 60 to 100 feet high with rounded spreading crown. The leaves are composed of five to nine leaflets, occasionally even as many as thirteen.

THE HICKORIES.

All of the twelve known species of hickory belong to this continent and five or six of them are native to Canada. None are found west of Ontario and most are confined to the southern part of the province and south-western Quebec. The "pecan" of commerce is the fruit of *Carya illinoensis*, the southern species.

BITTERNUT HICKORY OR SWAMP HICKORY, *Carya cordiformis*. This is a tree which grows from 50 to 60 feet high, with a large spreading crown when growing in the open. It has slender twigs as compared with other species and its winter buds are sulphur-yellow. The leaves consist of seven to eleven leaflets. The tree prefers low, wet situations near streams, although it thrives well in good soil on higher ground. It is an important species on account of its relatively wide distribution.

SHAGBARK HICKORY, *Carya ovata*. This is one of the largest hickories, reaching a height of 50 to 80 feet. It has a straight and columnar trunk and in the open the crown resembles an inverted cone in outline. In the forest the crown is small and flat. It receives its name from the fact that the bark shags off in large plates free at both ends. The buds are yellowish-brown and large. The leaves consist of five to seven leaflets. It requires a good, rich soil, deep and well-drained on account of its long tap root.

MOCKERNUT HICKORY, *Carya alba*. A tall tree, 75 to 90 feet high in the forest, but shorter with a broad, round-topped crown when growing in the open. The buds are large and can be distinguished from the shagbark by their lack of persistent outer scales. Leaves consist of seven to nine leaflets. Prefers well-drained, rich slopes and is found in the counties of Ontario bordering the lakes.

PIGNUT HICKORY, *Carya glabra*. This is a smaller species with much-twisted and contorted branches. It reaches a height of 40 to 50 feet and the crown is narrow and long, reaching well down the trunk. Winter buds small and yellowish-brown. Leaves composed of seven to nine leaflets. Found in the Niagara Peninsula and the counties bordering Lake Erie. *Carya microcarpa*, the Little Pignut, is a variety of this species. One or two specimens of *Carya ovata* are hardy at Ottawa.

Carya illinoensis, "the pecan" is not hardy in Canada, except perhaps in parts of British Columbia. Several young trees planted at Sidney, B.C., have done well so far.

THE CHESTNUTS.

SWEET CHESTNUT, *Castanea dentata*. Only one of the four known species of true chestnuts is native to Canada. This species, however, is highly prized for both its wood and its fruit. It grows naturally in Canada only in a restricted portion of Ontario from the Niagara river westward to the Detroit river and Lake St. Clair.

It is generally a large tree, about 75 feet high. The crown is spreading and usually rounded. The leaves are about six inches long, narrow and taper-pointed with toothed margins. A few specimens of this tree are hardy at Ottawa, but do not produce nuts. In the Niagara district the nuts are produced in large quantities and are collected as they fall from the trees in September and October. There is a good local market for the nuts and quantities are used by those who collect them from the woods. Large single trees growing in the open are very productive. The tree thrives in any good soil and is common in pastures and rocky woods. Unfortunately a parasitic bark disease, *Diaporthe parasitica*, is destroying it in large quantities. The tree bears fruit at the age of five years and is valuable for its timber at about 15 years of age. *Castanea sativa* is the European species and a variety of this known as Paragon is also planted for commercial purposes in the Niagara district.

THE HAZELNUTS.

The hazelnuts are mostly shrubs, rarely trees. There are eleven known species throughout Europe, Asia and America and many horticultural varieties are cultivated. The hazelnuts belong to the Beech Family and are therefore closely related to the chestnuts and oaks. Two species are native to Canada and many of the horticultural varieties succeed in southern parts of British Columbia and Ontario. Efforts have been made to make profitable plantings in certain parts. These efforts have been handicapped by the fact that the fungous disease, *Cryptospora anomala*, common on the native species, also attacks imported varieties. The hazelnuts require moderately rich, well-drained soil. Injury from frost is generally a possibility as both staminate and pistillate catkins develop in the autumn and quickly swell under the influence of mild weather in the late winter.

The Kentish Cob, or Filbert, derives its name "Filbert" or "Fullbeard" from its longer husk which extends beyond the nut. The generic name, hazel, is from the Anglo-Saxon "haesel", a hood, which the shorter husks of the hazel resemble.

HAZELNUT, *Corylus americana*. This species is a shrub growing from three to eight feet high. It furnishes the brown hazelnut of the market, which is gathered during August and September. It is common in thickets and hedge rows in the southern parts of Canada.

BEAKED HAZELNUT, *Corylus rostrata*. This species is also found in thickets and hedge rows. The fruit is covered by a bristly cup which terminates in a long tubular beak, hence its name.

MICROSCOPY AND BIOLOGICAL ACTIVITIES AT RUHLEBEN.*

(British Civil Prisoners of War Camp).

Among the unfortunate students in Germany who early in the war lost their liberty and found themselves interned at Ruhleben, was Grant Lochhead, only son of one of this society's esteemed members, Wm. Lochhead, Professor of Biology, of Macdonald College, Que.

Grant Lochhead studied at the University of Leipzig, having just been granted his Ph.D. degree; but he did not succeed in leaving Germany in time when war broke out. Those who know the pleasant, courteous and happy dispostion of Grant Lochhead, will be glad to hear how he and other young Britishers succeeded by a dogged determination in overcoming to some extent, the boredom and ennui—to say the least—of a prisoner's camp life.

DR. GRANT LOCHHEAD
Lately a Canadian prisoner at Ruhleben Camp, Germany.

“ . . . . Ruhleben camp is situated on a bleak plateau on the site of the well-known race course to the west of Berlin. This fact will account for the mention of “betting booth, hay loft and grandstand.”

“Roughly the camp is made up of students from the Public Schools and Universities. The educational work has been going on there for the past two and a half years. As an introduction to the prospectus of work for the autumn term 1916, we find among other notices the following:—In most subjects the tuition provided at the school, ranges from that required by absolute beginners to that required by advanced university students. The term consists of fourteen weeks; the total subscription of 3.50 marks should be paid in advance, if possible.”

From a letter of Dr. A. Eckley Lechmere to R. Paulson, F.R.M.S., dated August 14th, 1917:

“When the laboratory started in the spring of 1915, we were fortunate enough to have several microscopes at our disposal. These were supplied by people in the camp who had their instruments in Germany. I had been working at plant diseases in Munich with Professor von Tubeuf, and the cytology of sex in insects with Dr. Büchner, so I was fortunate in having both instruments and a certain amount of material at hand which Prof. von Tubeuf kindly sent me here. Since then several more instruments have been obtained by other students. We have now an excellent microscopical outfit for general laboratory work. The instruments include the following items:—

One Leitz binocular, two Leitz C, two Leitz GH, two Winkel, one Seibert, and one Nietsch, one Baker Diagnostic, and a set of eight dissecting lenses, two polariscopes, micrometer eye-pieces, camera lucida and microspectroscope, one Leitz Minot microtome.

For sitting accommodation we use a large deep bench, fitted under the windows in the wall of the loft. The windows themselves have been much enlarged, and this year we have had skylights let into the roof. For work in the evenings I have arranged a small transformer to work from the main electric supply, which gives sufficient current to run twenty 4-volt lamps; at the same time it can supply current for heating a small drying-box for the microtome slides, and is further used for an electric needle for orientation of sections in wax.

The general instruction in laboratory work and the preparation of lectures do not leave much time for original work. The only things I have attempted here have been a series of stages in the development of the Orange Scale insect (*Aspidiotus*), and a few preparations of a curious mite infesting the earwig. The body of each mite has a long stalk which forms a branchng meshwork gradually covering the body of the host. I have never seen it before, and do not know the genus. During the months of May and June this year I kept a series of eggs of *Limnaea stagnalis*, *Planorbis corneus* and *Valvata piscinalis* under observation for the early stages of development. I have a large number of eggs embedded for future cutting, after using pereny and acetic sublimate as fixing reagents. Towards the end of an egg-laying period in *L. stagnalis*, I frequently found some of the egg-capsules with numerous eggs, up to fifteen in number instead of the normal single egg. I also managed to hatch out several cases of two embryos from one capsule. A curious incident occurred with the aquarium in which there were specimens of *P. corneus* and the only specimen of *Paludina vivipara* I have been able to find. One night five of these snails including the *Paludina*, were dragged out of the aquarium and devoured by a rat. The aquarium is now removed to a safer place for protection from further invasion."

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*Abstracted from “Microscopy at Ruhleben”, a paper read by R. Paulson, F.R.M.S., Jour. Roy. Micr. Soc., March, 1918, part one, p. 26 (H.T.G.)

". . . . the camp is made up of students from the public schools and universities," Ruhleben, Germany.

Report of Biological Activities in Ruhleben. From Michael S. Pease, B.A., Cantab., dated August 14, 1917.

"The first outward sign of biological activity in Ruhleben appeared in the spring of 1915, when Dr. A. E. Lechmere started a series of lectures on Elementary Biology. These were held in a disused betting-booth, and attended by half-a-dozen enthusiasts. In the summer, one of the grand stands was set aside for lectures, and Dr. Lechmere continued his course on the Protozoa, while I continued a course of twenty lectures on Heredity. At Christmas, 1915, the loft of Barracks 6 became available for educational purposes, and the first weeks of the new year saw the conversion of a corner of a somewhat dilapidated hay-loft into a biological laboratory. By the end of January the accommodation for eight microscopes was provided. The necessary glassware and reagents were got in from Messrs. Leitz, and practical botany, of a necessarily elementary character, was started with twenty-one students.

In the following terms regular lecture courses in botany were given by myself, and the corresponding practical work was of a more thorough and extensive nature. The ground covered has been as follows:—Bryophytes and Pteridophytes (Summer, 1916); Gymnosperms (Autumn, 1916); Algae (Lent, 1917); Angiosperms (Summer, 1917).

Spirit material was kindly presented to us by Prof. A. C. Seward, Dr. Darbishire, and Prof. Tubeuf.

We are indebted to Prof. Engler for a weekly supply of flowers from the Kgl. Botanischer Garten, Dahlem, for the systematic course. A pond within the race-course has been our source of fresh material for Algae and Protozoa.

The equipment of the laboratory has been continuously improved. A cable was laid on to give us electric current day and night. A transformer was constructed on the premises, and each microscope provided with a 4-volt lamp for work after dark.

Several electrically heated incubators were also fitted up, and last Easter permisson was obtained to put in sky-lights and to fit up a water-supply.

With the possibility of a continuous source of heat, we were able to consider paraffin embedding.

Serious difficulty has been encountered in the construction of a satisfactory automatic electric thermostat for the embedding bath. We have recently secured a Hearson's capsule, and an improved model of embedding bath is now being made. Nevertheless, a considerable quantity of material has been satisfactorily imbedded, and a beginning is being made with the technique of Cytology. Last Christmas a first-class microtome (Minot model by Leitz, cutting to 1a) was purchased, but the rigours of the winter, followed almost instantly by those of a phenomenally hot May and June, made it impossible to start microtomy until recently.

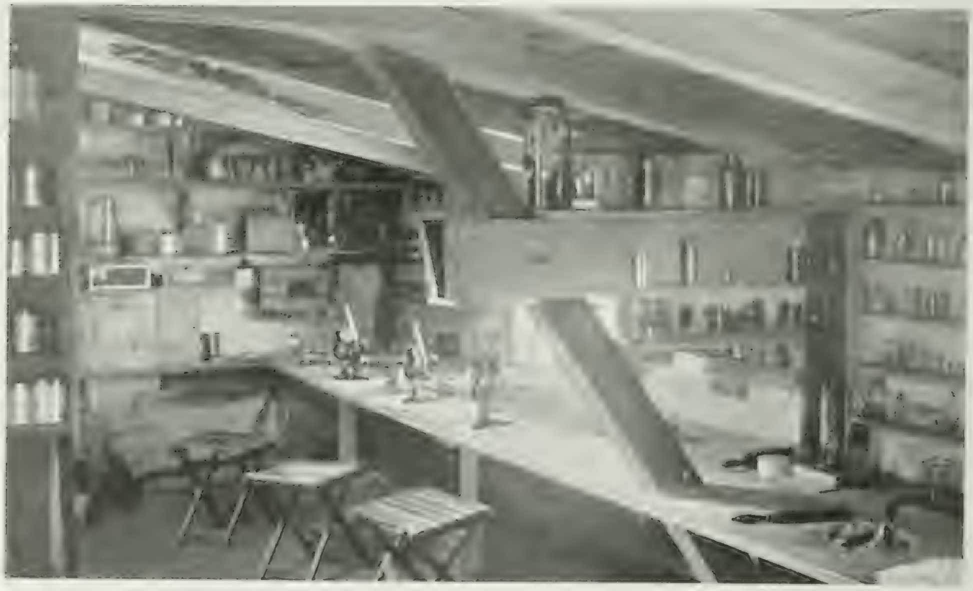
It has been impossible to do practical work in Zoology, but Dr. Lechmere's lectures have continued to draw an enthusiastic band of students. His course so far has covered:—Protozoa (one term); Coelenterata (one term); Vermes (three terms); Echinodermata (one term).

And he has just finished the second term of his course on Mollusca.

At the same time he has also started a course on Invertebrate Embryology. Animal physiology has been very exhaustively treated (again only theoretically) by Mr. S. R. Edge, B.A., Cantab. Practical instruction has been given in the testing of agricultural seeds by Mr. A. Hill, B.Sc., Aberdeen, and for this course a large electrically-heated incubator was constructed.

This summer, new space was allotted to science, and this was made use of to accommodate a library, shared jointly by the biologists, chemists and physicists. The library provides a seating accommodation for working, and contains over 500 volumes, mostly the property of the science staff, but many also supplied by the Board of Education.

At the present "Nature" is at once our only periodical and only link with scientific activity outside."



View of the laboratory, Ruhleben Camp, Germany.

LOCATION OF TOWNS AND VILLAGES IN THE OTTAWA VALLEY.

By J. Keele, Ottawa.

(Continued from page 70).

In the October issue the writer stated that the exact location of villages in the valley of the Ottawa was determined either by water power or by points on former routes of transportation.

In most cases the land in the vicinity of the sites selected was of such a surface character that it was suitable for the requirements of habitation and the growth of villages into towns. In other words the topography in general presented no serious problems to municipal engineers in the matter of street grades, drainage, bridging, or water supply.

The growth of a village has been influenced by its location and environment. In most cases the growth around the original mill site was due to its becoming a trading centre for the surrounding farming community. In some cases a basic industry like lumbering and saw mills furnished the mainstay of the village while trading was secondary.

The construction of lines of railway connecting up these towns and villages with one another and with the main highways of commerce was a later development bringing in the industrial stage, when towns competed for industries to come and locate within their limits. At this stage favourable location with regard to natural resources and to land and water transportation were of importance; although other considerations which had nothing whatever to do with geography, such as offering a bonus to manufacturers, was taken into account in the decision.

A short sketch of the physical geography of the region in a general way has been given so that we are now in a position to consider a few localities in more or less detail. From what has been said, however, we see that the character of the surface has had considerable influence on the population, the flat clay land being the most important in the development of large communities while a great part of the upland sets its face rigorously against any attempt at cultivation and human habitation. Between these two extremes there is much good agricultural land as well as considerable debatable ground where such considerations as, whether forest would not be more economic than cultivation, enter in.

RIDEAU RIVER AND TRIBUTARIES.

The Rideau river drains a group of lakes of the same name situated in the less rugged portion of the upland underlain by the belt of crystalline rocks which extend southward to the St. Lawrence between Brockville and Kingston. On emerging from the lakes and the upland it flows over a drift covered plain-like region, where it has cut down to bedrock only at a few places. At most of the points where it flows on bedrock there are rapids or falls, the most notable being the last one on its course where it tumbles from a cliff into the Ottawa river at Ottawa.

The Rideau is a good example of a recent drainage channel almost entirely controlled by the character and distribution of the glacial drift and not by the underlying bedrock. It would normally flow eastward and enter the Ottawa river much further down than it does but on encountering the belt of morainal ridges which stretch from Ottawa to Prescott it is diverted toward the north.

It is stated that in the year 1793 three brothers named Burritt from Connecticut explored the Rideau river, probably coming in by way of Brockville from the St. Lawrence route, and took up land on its banks. The point on the river known as Burritts Rapids which may have been their original location never developed into a village, but Merrickville which is situated on a fall about 7 miles above this point did grow to be a village.

A canal was constructed primarily for military purposes by the Royal Engineers during the years 1828 to 1832, which utilized the Rideau lakes and river to their full extent. The long stretches of quiet water with only an occasional obstruction where locks had to be built made it especially favourable for this purpose. A series of three locks was necessary at Smiths Falls, a point which afterwards grew to be a town of some importance.

The western limit of marine clay sediments appears to occur here, but there is no large area of it in this locality, the clay being confined to a few patches along the Rideau river. Glaciation seems to have removed a good deal of the older soils from the level region east and north of Smiths Falls and much of the land is poor in consequence as the soil consists only of a thin sheet of sandy drift overlying the bed rock. The bed rock in that area is mostly badly creviced magnesian limestone through which the rain water disappears quickly from the surface, so that it becomes almost barren during dry spells.

Land of this character does very well for fruit trees or for wood lots as a source of fuel and other merchantable timber but is of little value for cultivation of crops. Its chief use in farming is to furnish pasturage for sheep and is well adapted for this purpose in moist weather when the grass is good.

The first railway to enter the Ottawa valley started from the main line of the Grand Trunk at Brockville and was designed to serve the towns of

Almonte, Arnprior and Renfrew, as well as Ottawa. The first portion of the road was, therefore, built northward to Smiths Falls and from this point lines were extended both east and north to reach their objective stations. A branch line was also built westward from Smiths Falls to Perth about the year 1850.

Later on, the Ontario and Quebec railway projected from Toronto to Montreal acquired that portion of the line between Perth and Ottawa, and finally the whole became part of the Canadian Pacific Railway system. Smiths Falls was made a divisional point in the system, and a location for railway car works and so became a place of residence for a considerable number of railway employees.

A point like this on a navigable waterway and with such good railway connections had considerable advantages for manufacturing purposes as the various industries could assemble raw materials and distribute finished products with ease; and we find that several manufacturing firms availed themselves of these facilities.

It would appear then that Smiths Falls owes its development as a centre of population more to railway and manufacturing influences than it does to farming.

The town of Perth is built on the Tay river, the largest tributary of the Rideau river. It is situated on the Canadian Pacific Railway about eleven miles west of Smiths Falls.

The town site and surrounding country was occupied by settlers, principally made up of soldiers from regiments disbanded at the close of the Napoleonic wars. These were offered a free passage, 100 acres of land, some farming implements and a limited amount of rations by the British Government if they would locate in Canada instead of the United States where so many were going at that time. The townships of Bathurst, Drummond, and Beckwith were surveyed wiih this object in view and the first company of settlers arrived in 1816. A site for a village was chosen which would be a centre for the community and doubtless the factor which determined this site was the waterfall on the Tay river where a saw mill and grist mill could be erected later on. The settlers who chose to locate in this district were especially fortunate as most of the land carried a deep fertile soil and in time it became one of the best agricultural districts in the Ottawa valley. The farms along the Scotch Line road for about six miles out of Perth in a southwesterly direction are especially productive and the appearance of the dwellings and farm buildings are visible evidence of prosperity.

The Perth district is on the boundary between the hilly country underlain by granite gneisses and other crystalline rocks and the nearly level valley plain which is floored with sandstones and dolomites.

The granitic rocks are mostly covered with a fairly thick sheet of boulder clay, so that glaciation seems to have improved this district for agricultural purposes at the expense of the district further east where the soils are very thin. The movement of glacial ice in this region was from northeast to southwest. The boulder clay left from the glacial ice did not reach very far to the west of Perth and an almost barren region as far as agriculture is concerned is encountered beyond the clay limits, and we do not find another point of importance on the railway line until coming to Peterboro a distance of 120 miles, where clays and limestones begin again.

Perth has developed a stone architecture that gives a certain distinction to the town, on account of the opportunity offered by the beds of sandstone in its immediate vicinity which are easily quarried and make a good enduring building stone. This sandstone formation furnishes two varieties, a white or light grey stone and a mottled pink and grey stone. The Anglican church is a good example of the use of the white stone as well as being one of the best pieces of Gothic architecture in any of the towns of the region. The C.P.R. station is an example of the use of the mottled stone. Besides its local use these building stones have been quarried and shipped to outside points, some of it going as far as Montreal, the canal connection to Perth making it economical to ship heavy cheap material such as stone. There was considerable mining activity in the past in the neighborhood of Perth particularly in the township of North Burgess, which assisted to some extent in its development as a centre. Mica, phosphate, and iron were the principal minerals that were mined in this locality.

Several of the residences in Perth were built by farmers of sufficient means who desired the social advantages offered by the town for the remainder of their years, leaving the business of farming to be carried on by the next generation.

Of late years the town has been augmented by various industries which include woolen mills, chemical and drug and soap works, and a shoe factory, but this was after it had attained a considerable growth due to the productivity of the surrounding land.

MISSISSIPPI RIVER AND TRIBUTARIES.

The Mississippi river drains a perfect maze of lakes situated in the Laurentian upland in Frontenac and Addington counties. A reference to the map will show the curious course the river takes after it issues from the upland. Instead of continuing to flow eastward and becoming a tributary of the Rideau river it actually flows toward the northwest and enters the Ottawa river about four miles below the mouth of the Madawaska river where the town of Arnprior is situated. The erratic course taken by the Mississippi river is owing to its entering a pre-glacial depression which existed almost along the contact of the Paleozoic rocks of the Ottawa valley plain and the granitic rocks of the upland and which lay nearly at right angles to the course of the upper part of the river. In thus shortening its course the river had to drop a vertical height of 200 feet in a distance of 25 miles in reaching the Ottawa. It accomplishes this by a series of falls between comparatively still stretches of water. The towns and villages of Galetta, Pakenham, Almonte, Appleton, and Carleton Place, named in order from the mouth of the river up are situated on these falls.

One of the principal features of the trough occupied by the lower porton of the Mississippi river is the large lake known as Mississippi lake. One of the first white settlers in 1823 wrote that "some of the islands of this lake were inhabited by Indians whose hunting ground is on the north side of the lake and who are far from being pleased with the encroachments our settlers are makng on their territory." This lake is now a popular resort in the summer for the people of Carleton Place and other towns.

The first railway line into the Ottawa valley projected from Brockville, Smiths Falls and thence to Renfrew, follows the valley of the Mississippi river and served all of the above points except Galetta as the railway line diverges to Arnprior before reaching that point.

The marine stoneless clay is found in the valley of the Mississippi river as a continuous sheet from Almonte to Pakenham but is restricted to a narrow strip owing to the proximity of the Laurentian escarpment along the west and to low ridges of Paleozoic limestone, whose flat tops are nearly bare of soil, along the eastern side of the valley. The Laurentian upland, however, just west of Almonte does not prove such a barrier to cultivation as it does at other parts of the region by reason of the broad bands of crystalline limestone occurring here which carry productive soils. The surrounding diversified farming lands whose business is tributary to Almonte as well as the woolen industry which is established there contributed to the development of this very picturesque village.

In 1820, two brothers named Morphy located at what is now known as Carleton Place but then as Morphys Falls, and in the same year a Mr. Coleman purchased the waterpower at that point. The condition of the purchase was that within six months after the date of sale a bushel of wheat should be ground in the mill about to be erected. This was the first mill on the road from Perth to Bytown (Ottawa).

When the Canadian Pacific railway constructed its transcontinental route it included part of the old line from Brockville to Renfrew in the system. The point at which the transcontinental line coming from Montreal through Ottawa joins the old line is at Carleton Place, which became a junction point. A few industries took advantage of the transportation facilities offered at Carleton Place, but the chief business is in supplying the needs of the surrounding farming population. One of the minor industries of Carleton Place is lime burning, the stone used being the white crystalline limestone which occurs in large masses a few miles west of the town. The burned lime or quicklime is shipped to many distant points.

The Clyde river is the principal tributary of the Mississippi and lies wholly within the Laurentian upland, in the county of Lanark.

The Lanark settlement was an extension of the Perth settlement to which reference has been made. It was occupied by immigrants from the western part of Scotland in 1820. An old record of this settlement states that "the face of the country here is more diversified with small hills than in the Perth settlement but where the soil is not encumbered with rocks it is equally good. In a convenient spot on the banks of the river a village was laid out and a government store erected. A saw mill and a grist mill were erected soon after the village was laid out, and timber being abundant in the neighbourhood, one inch board can be procured at six dollars a thousand feet."

The convenient spot was the falls on the Clyde river about two miles above its junction with the Mississippi.

Although the village of Lanark draws its chief business from a district situated wholly within the area of Archean rocks and is the only village in the region under discussion that does so, it should be noted that a great deal of bedrock in this locality is crystalline limestone and that the boulder clay sheet covers most of these and the accompanying granite rocks in the neighbourhood. At a distance of about 10 miles north or west of Lanark a rugged country absolutely devoid of clay and with very little crystalline limestone is encountered where agriculture ceases or becomes sporadic.

The village of Lanark was long famous for the excellence of the products of its woolen mills, but these were accidentally destroyed by fire a short time ago and the industry moved to Perth.

Intelligent administration on the part of the local authorities and a convenient supply of good materials have made this locality famous in another very desirable way, the construction and maintenance of good roads.

Crushed crystalline limestone is the chief road material used but there is an abundance of gravel in the glacial kames and eskers which are one of the most interesting features in this locality.

THE MADAWASKA RIVER.

The Madawaska river is the largest tributary of the Ottawa within this region. The greater part of the Algonquin Provincial Park with its innumerable lakes, and large portions of Haliburton, Hastings, and Renfrew counties are drained by this river and its branches. The Madawaska river, therefore, lies almost wholly in the rugged Laurentian upland and only emerges from it when within about 10 miles from the Ottawa. In this part of its course it flows across a plain covered with stoneless marine clay.

Notwithstanding the length and volume of this stream and the extent of territory which it drains there is only one town on its course, viz. Arnprior, situated at its mouth and one village, Bancroft, in Haliburton county on the York branch. Calabogie, Combermere, and Barrys Bay are small trading points situated on its course but none of these ever attained the size of incorporated villages.

Traditions concerning lumbering operations attach more frequently to the history of the Madawaska river than to any other stream in the region on account of the large area of its drainage basin, the vast groves of red and white pine it contained and the turbulence of its waters.

As long as the pine lasted lumbering was the business of the river from its headwaters to its junction with the Ottawa and everything else was subsidiary to it.

The origin of Arnprior is part of the story of the last Laird of McNab, a picturesque character who conceived the bold if ill-fated design of repairing his broken fortunes and re-establishing the once powerful clan of which he was chief, by a settlement on the shores of the Ottawa. Following an agreement with the Government of Upper Canada, the meaning of which was later to become a subject of fierce dispute, McNab arrived in 1825 with the first of the settlers to be located by him as tenants in the township which perpetuates his name. He proceeded to erect a dwelling on the high shore of the Ottawa river just west of the mouth of the Madawaska, a site of much dignity and natural beauty now embellished by the fine grounds and residence long occupied by the late H. F. McLaughlin.

The chief's house was according to Bouchette in his British Dominions, "exceedingly comfortable," and he extolls "the well furnished board and the cordiality of a Highland welcome" as mitigating for a period the hardship of a canoe trip down the Ottawa in the course of which he became a guest of the "Noble Gaël."

The circumstances of McNab as landlord to a few scattered settlers were not such as to entail the growth of a village about his residence which was moreover subsequently removed to White lake, 10 miles west of Arnprior. He had induced, however, three brothers named Buchanan, kinsmen of his, to join his little colony and create a sawmill at the falls of the Madawaska. A hamlet thus came into being and was by the Buchanans named Arnprior after their family seat in Scotland.

At that time and for many years after the business of sawing lumber at this region was of no great importance, except as regards local needs. Pine timber for export was hewn in the bush and floated down the rivers to tide water in rafts. The business done at the Arnprior sawmills gave little promise of the volume it was afterwards to assume and an English firm to whose hands it passed from the Buchanans, closed down the mill. We must suppose the village, therefore, to have been almost deserted when in 1852 the property was purchased by Daniel McLaughlin, who became also the owner, then or subsequently, of much adjacent land formerly owned by McNab.

With this event the permanent growth of the place may be considered to have commenced. Two mills were built at the falls and supplied from the vast quantity of pine logs which for many years were floated down the Madawaska. With the expansion of the business which has continuously been owned by the same family, large steam driven mills were erected on the Ottawa and with the sources of supply made available by that great river and its tributaries the firm's operations reached dimensions which classed it as one of the most important producers of pine lumber in the world. Lately the water mills were removed as the Madawaska has ceased to be an important factor in the log supply and the water power has temporarily gone into disuse. For some years the mills have been supplied largely from the firm's lumber holdings in the Petawawa, Black river and Kippawa districts.

From this brief outline it will appear that although Arnprior is situated in a fertile highly cultivated district its origin, growth, and the occupaton of its people have a closer relation to the forest than to the farm.

The natural resources of the district surrounding Arnprior consist of an extensive area of flat clay lands, which have great agricultural possibilities.

The clay extends about 10 miles west of Arnprior and about 6 miles to the northwest. Beyond these limits certain patches in the upland underlain by crystalline limestone are capable of cultivation.

Brick and tile are made from the upper part of the marine clay in the banks of Dochert Brook just outside the town limits. The tile are extensively used for underdraining the clay lands in the neighborhood and are also shipped to distant points for this purpose.

This is an example of supplying geographic needs by using the natural resources at hand.

Outcrops of limestone both of Archean and Paleozoic are abundant in this vicinity. The former is a banded grey and white marble which was used for the interior of the senate and commons chambers in the house of Parliament at Ottawa destroyed by fire a few years ago.

(*To be continued*).

NOTES AND OBSERVATIONS.

A CORRECTION. In a list of amphibians and reptiles of the Ottawa, Ontario, district, published in the September, 1918, number of THE OTTAWA NATURALIST, *Pseudacris triseriata* should be *Pseudacris feriarum.*

CLYDE L. PATCH.

THE NESTING OF THE BLACK-CROWNED NIGHT HERON IN SOUTHERN ONTARIO.—In answer to W. E. Saunder's query as to the nesting locality of the Black-crowned Night Heron in western (southern) Ontario, I think it well to record some evidence that I obtained in 1909 at Detroit, Mich. In the first week of May of that year I was presented with a female bird that had been killed by a Mr. Meredith, of the New York Coal Co., in the preserves of the Toronto Shooting Club on the Indian reservation, Walpole Island, St. Clair Flats. Mr. Meredith stated that they were very common and nested on the ground in such numbers that he could have gathered a bushel of eggs with ease. This species usually nests in trees often in company with Great Blue Herons, but ground nesting has often been recorded for the species. Without doubt this was and may still be one of the important nesting colonies of this heron in the section. Herons feed at great distances from their rookeries and it is not improbable that the London specimen hails from this one.

P. A. TAVERNER.

A BIRD CAUGHT IN A TREE.—Last summer while walking on the north side of Watson lake, British Columbia, I heard a woodpecker give a startled or pained cry, and, on approaching, found it caught by the neck in the crotch of a tree, and clinging vigorously to the tree at a point above its head. Watson lake is on the somewhat arid Fraser plateau of the interior of southern British Columbia. The country is monotonous, being rather flat but slightly rolling, with interspersed jack pines, poplars and but few other trees, with small lakes and meadows. Many of the lakes are saline.

The bird, so far as I am able to judge, was some species of sap sucker.

I took hold of the bird and with some difficulty unclasped his feet from the tree, at the expense of a slight prick from one of his talons. Lifting the bird I was surprised to find that his head was not held tightly in the crotch, but was simply loose in it—the bird being apparently too greatly frightened to let go with his feet. In fact, had he done so, a fall of his body might have either wedged his neck in the crotch or broken his neck.

After carrying the bird some distance, while thinking of his disposal, I concluded that I did not care to skin him in order to make a museum specimen. I released him, and to my surprise, instead of falling or flying a short distance and gathering himself together, he flew strongly out of sight.

HARLAN I. SMITH.

BIRD MIGRATION.—Just what power birds possess in shaping their migration flights and what directs the course they persue is not definitely known. It has been attributed to their instincts. They never fail to reach their ultimate destination. In a very interesting article which appeared some time ago in the *St. Louis Republic*, the writer, a scientist, discussing the subject of bird migration, considered the idea of birds flying in the rarified atmosphere three miles above the earth's surface, and being guided by the topography of the country at night when flights are mostly made, as being somewhat erroneous. He was of the opinion that on their long flights birds are guided by the stars, and he supported his theory by citing as evidence the fact that "when the stars were obscured by clouds the flocks become bewildered and seek the ground." Birds possess the sense of perception and orientation in a much greater degree than man and under like conditions, as a traveller at night makes his observations and directs his course by the stars, so it seems reasonable to assume that birds may do the same. It has been observed in Bermuda that after very dark nights, large numbers of migrants are found all over the islands. The first clear night they are off again.

C. B. HUTCHINGS.

GANNET COLONIES.—I was much surprised in reading the May issue of THE OTTAWA NATURALIST to learn that, so far as is known to ornithologists, but two colonies of gannets exist in eastern North America.

Mr. P. A. Taverner, to whom readers of THE NATURALIST are indebted for a very interesting description of "The Gannet Colonies of Bonaventure Island," I am sure, will be quite pleased to learn that there is yet another colony of gannets that has escaped the ravages of the ruthless hunter.

On the south coast of Newfoundland, near Cape St. Mary's, there is quite a large rookery, situated on a very inaccessible, detached rock, standing, separated from the main land by a narrow chasm.

This asylum stands with its feet in the wild surf and rears its head fully two hundred feet above the sea. Here the gannets "secure from guns and men," congregate in thousands, and undisturbed bring forth their young.

As a lover of the defenseless things of nature I am delighted to see gentlemen like Mr. Taverner making so brave an effort to bring us into more intelligent and sympathetic relationship with the humble things that shame us by living their little lives in such perfect harmony with the will of the Divine Creator.

I hope, at a later date to submit an account of the rookery above referred to.

ARTHUR ENGLISH, ST. JOHNS, NFLD.

ORIGIN OF PLACE NAMES IN OTTAWA VALLEY. —*The Name Gatineau.* Referring to Philemon Wright's farm Gatenoe (Keele, OTTAWA NATURALIST, October, 1918) Wright gives its location as "4 miles up a large river called Gatenoe". He elsewhere uses the spelling Gateno.

Nicholas Gatineau dit Duplessis resided at Three Rivers from 1650 to his death in 1683. He traded with the Indians on the St. Maurice river, whose source is near that of the Ottawa and Gatineau. He seems also to have traded on the Ottawa river.

It is an open question whether the river or the point at the mouth was first named for Gatineau. Mr. Sylvain, Library of Parliament, quotes Mr. Sulte for the statement that Gatineau traded with Indians at Gatineau Point, which became known as the "Pointe de Monsieur Gatineau."

The Name Britannia. Philemon Wright began Britannia farm 1804 and hed cleared 700 acres by 1823. Through the farm it is stated in Crown Lands Committee Report, 1824, there is "a good road running in a westerly direction and (it) also has two fronts upon the great road leading from the Columbia falls to Lake Chaudiere."

The great road referred to was built in 1818 when "we laid out a road to the lake Chaudiere, seven miles in length, called Britannia road."

Columbia farm and Britannia farm apparently commemorate Wright's native country and his parents'.

Is there any connection between this Britannia farm and road on the Quebec side of the river, and Britannia on the Ontario side, concerning which, in Murray's British America, 1839, it is stated:

"Some distance above Bytown is Britannia, a valuable property with extensive mills, finely situated near the beautiful rapid Des Chenes."

R. DOUGLAS, *Secretary*,
GEOGRAPHIC BOARD, OTTAWA.

PROGRAMME OF WINTER LECTURES, O.F.N.C., 1918-1919.

December 10, 1918—"Natural History and Affairs in the Tropics." Major J. L. Todd, Board of Pension Commissioners, Ottawa, lately Professor of Parasitology, McGill University.

January 8, 1919—"New Plants for Old." Dr. M. O. Malte, Dominion Agrostologist, Experimental Farms Branch, Dept. of Agriculture.

January 22, 1919—"The Development of a Design." Dr. E. Sapir, Head of Division of Anthropology, Geological Survey of Canada.

February 5, 1919—"The Game Resources of the Yukon." Mr. Frederick J. Lambert, formerly of the Alaska-Yukon Boundary Survey.

February 19, 1919—"The Work of the Dominion Astronomical Observatory." Dr. Otto Klotz, Director, Dominion Astronomical Observatory.

March 5, 1919—"Our National Parks." Mr. J. B. Harkin, Commissioner of Dominion Parks.

March 18, 1919—Presidential Address. Dr. C. Gordon Hewitt, Dominion Entomologist and Consulting Zoologist.

At the conclusion of this address the Annual Meeting of the Club will be held for the purpose of receiving reports, election of officers for the ensuing year, and the transaction of other business.

THE OTTAWA NATURALIST

VOL. XXXII. DECEMBER, 1918. No. 6.

THE McGILL TOTEM POLE.

By C. F. Newcombe, M.D., Victoria, B.C.

This pole has been in the possession of McGill University for a great number of years, and it seems that the data which must have accompanied it have disappeared. The writer, about ten years ago, obtained, through the kind assistance of Dr. Adams, then in charge of the Redpath Museum, the negative from which the full length plate has been engraved. It was his hope that he might be able to learn, from Indians whose villages he was about to visit, something of the original owner, and the meaning of the various carvings. In this hope, however, he was disappointed. No one could recall the sale of such a pole, but at Masset it was agreed that it bore a close resemblance to a figure in Dr. J. R. Swanton's "The Haida" (Jesup N. Pac. Exped., V, pt. I, '05, p. 127, Pl. V, f. 1).

The two parallel columns will bring out more clearly than a mere description the closeness of this resemblance as regards the carvings:—

The McGill Totem Pole	Dr. Swanton's Model
Top Figure: Small bear on top of narrow cylindrical pole.	Similar, but cylinder segmented.
Second: Large bear with long projecting tongue and a face shown in each ear.	Same, but tongue longer and said to represent a large labret.
Third: Another seated bear with shorter tongue.	Bear shown at full length.
Fourth: Raven, with long projecting beak.	Same.

In each case there are certain small additional figures, which are shown on otherwise unoccupied surfaces of the large carvings. These are not identical, but as they are mainly ornamental and of no significance as crests, this disparity is of no moment.

There is nothing at all like the McGill pole in the large series of photographs of Haida and Tsimshian villages, which represent literally hundreds of totem poles.

MEANING OF FIGURES.

Dr. Swanton's explanation of the model from which the plate quoted was made is as follows, given verbatim:—

"The original of Plate V, Fig. I, belonged to Qogis, Chief of the Point Town People (R. 14), and stood in front of his house, Fort-House (Taodji Naas), on a hill close to Masset. At the bottom, above the doorway of this house, are a frog and a raven. The frog is introduced because ravens were said to eat frogs. All the other figures on this pole illustrate the story of the man who married a grizzly bear. The principal figure of this group, clasping in both hands what has the appearance of a tongue, but what was explained as a long labret, and wearing a dance-hat, is the Grizzly-Bear-Woman; below, and held in her embrace, are her two cubs; while still lower down is the full-length figure of another bear, representing her husband. Sitting on top of the dance-hat is still another cub."

There are several versions of the story to which Dr. Swanton refers. That one quoted by him, which was obtained from a Masset source by Dr. F. Boas, is as follows:

In this version the hunter belonged to the Eagle clan and was named Gats. Unsuccessful in his hunting he was one day seized by a bear which carried him to his den. The she-bear hides him between her legs. The bear goes hunting, and on his return asks his wife what became of the man. She says that he only brought his belt. She marries the man. The dogs (the man has two) return to the village. The people follow them, discover the he-bear, and kill him. The man and the she-bear have a child. Finally he is homesick, and his wife allows him to return.

The she-bear forbids him to look at his former wife. One day he goes hunting with his two human sons. He meets the bear and gives her food.

His companions are afraid. One day when he is drawing water he meets his former (human) wife and smiles at her. Next time when he takes seals to his bear wife her ears are turned forward. She jumps into the water, attacks him, and kills him and his two sons.

In a Tlingit version given by Dr. Boas, the man and his bear wife have three children. The children, according to most of the versions, took the form of bear cubs, but, when indoors, take off their skins and are then human.

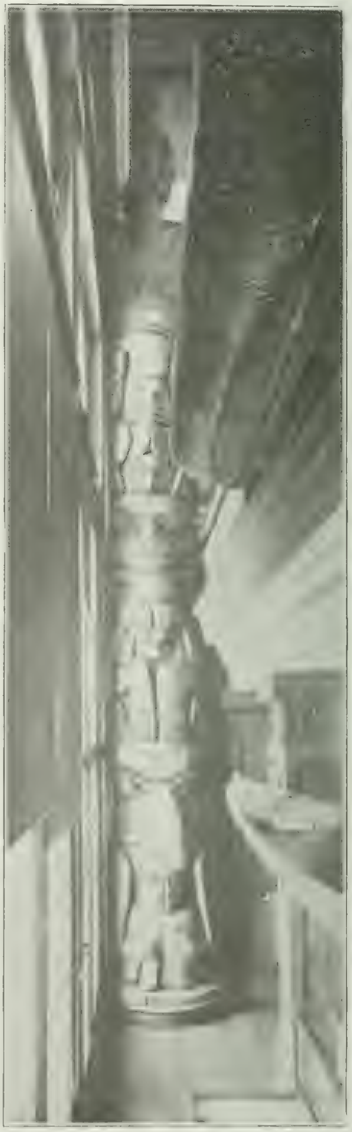
If the writer's inference is correct, and if Dr. Swanton's explanation of his plate may be applied to the McGill example, it will follow that only two crests are displayed, and that these are significant of the two great divisions into which the Haida are separated. The grizzly bear is one of the commonest crests used by families belonging to the Raven Clan, and the raven, for some inexplicable reason, is used only by the other division, the Eagle Clan. The remaining smaller figures do not represent crests, but only fill up space artistically and add to the seeming importance of the pole.

Dr. Swanton (l.c. p. 270) states that Qogis, or Qogits, a name meaning "common sea-otter", belonged to a family which originally lived at Rose Spit, at the extreme north-east end of the Queen Charlotte Islands. The name of the family is Kunalanas, the "town-people of the point", and this family was entitled to use certain crests, which are given in this order:—grizzly bear, Tcamaos (a mythical floating snag with magic powers), killer-whale and sea-lion, with, possibly, others.

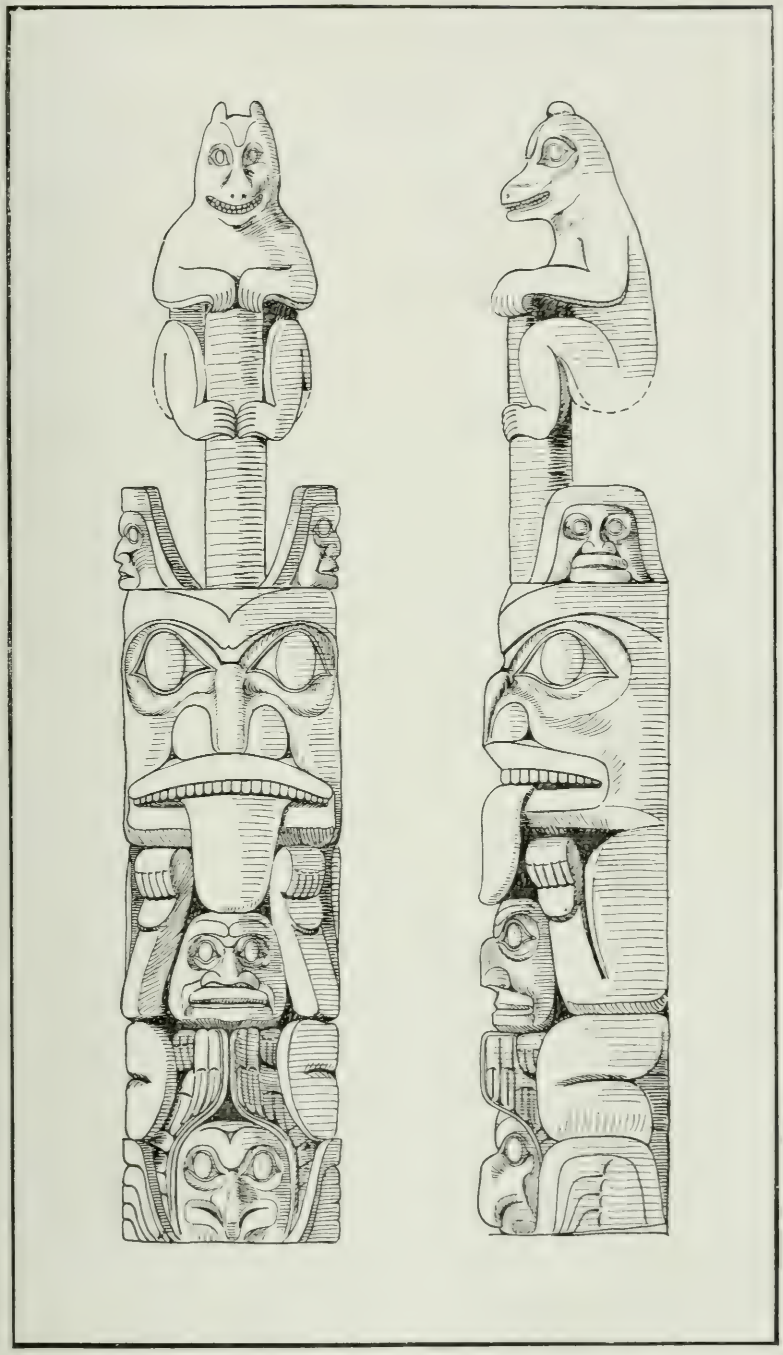
All of these crests are used by the Raven Clan. The raven must have belonged to the wife of Qogis. Both the raven and the grizzly bear are used by a great many families of the two clans and it would be impossible, therefore, without the aid of someone with local knowledge, to determine to whom the pole belonged.

Returning to the consideration of the McGill pole, it will be noticed that in addition to the three larger figures already mentioned there are four smaller ones. Taking these in order from above downwards, the uppermost is placed between the elbows and knees of what the writer supposes to be a female grizzly bear. A somewhat human head is seen above a pair of folded wings, below which is the head of a bird with short curved beak. The lower (he?) bear is holding a frog in its paws. The raven, at the bottom of the pole, shows a seated human figure below its beak. Of these four figures all that can be said is that, in addition to their purpose as ornament, they may also have reference to one or more of the numerous Haida stories. The lowest may quite probably illustrate some incident in which the raven assumed a human form. This it repeatedly did according to the old myths.

Whilst it must be admitted that there are minor differences between the original pole and that which is assumed to be a model of it, these differences are certainly less than those which occur in the case of another totem pole, which was acquired by the writer, and a model of it which was obtained by the resident missionary at Masset. The pole in question was purchased for the British Museum from a village close to Masset, and the model was



The McGill Totem Pole, exhibited in the Redpath Museum, Montreal, Que.



Architectural drawings of the upper part of the pole.

made at Masset itself. Both of these were described by Dr. A. T. Joyce in the *Journal of the Anthropological Institute*, Vol. XXXIII, 1903, Pls. xix, xx. The model was sent to the Museum in 1898 and the original in 1902 or 1903.

The first mention of totem poles on the north-west coast of America, so far as the writer knows, is that contained in *Cook's Third Voyage* (Vol. II, p. 317, Pl. 42). Two short squat posts are described and illustrated as standing inside a house at Nootka. Cook was unable to find out the meaning of these poles, of which there were numerous examples in the village, owing to want of knowledge of the language of the owners. This was in 1778.

Some years later the Spaniards, who had long occupied Nootka, came to the conclusion that these carvings were simply ornamental and only of significance in respect to the man whose supporters had contributed to the raising and putting in place of such timbers. The writer has purchased many such objects, and in each case it was explained by the seller that the carving represented either an ancestor of his family or some incident where real or mythical animals of supernatural power showed some favor to such an ancestor. (Relacion del viage por los Goletas Sutil y Mexicana, etc., etc., Madrid, 1802, pp. 128, 129.)

The next reference, and this time to poles of Haida make, is contained *in Meares' Voyages* (London, 1790, p. 367). Here, while recounting the experiences of Captain Douglas in the "Iphigenia" at the north-west end of the Queen Charlotte Islands, he speaks of "the great wooden images of Tartanee" but gives no further description of them. Fortunately, two years later, this place was visited by a French ship, the *Solide*, and many pages of the journal of the voyage are devoted to an account of this region. (Marchand, Voyage Autour du Monde; Paris, Tome I, 288-362). On pages 299-300 is a passage, too long to quote in full, which states that the door of the houses was elliptical, about three feet high and two wide and passed through the base of a large high trunk placed vertically in front of the centre of the houses. The door took the form of a gaping mouth, and was surmounted by a hooked beak about two feet long, proportioned in size to the monstrous figure to which it belonged. Above this was a squatting human figure and above this again a gigantic statue of a man in an erect position, wearing a hat of sugar-loaf shape, the height of which was almost equal to that of the man himself. On those parts of the surface not occupied by the principal subjects there were scattered here and there carvings of frogs or toads, lizards and other animals and the limbs of the human body. It was explained by a chief that the erect human figure represented a man of high rank who was venerated in this country.

It was learned independently, both by Dr. Swanton and the writer, that in the early days instead of poles the Haida used large cedar planks for the display of their crests, etc., in front of their homes, and that the doorway often passed through the centre of these planks. That the use of this flat form overlapped that of the cylindrical one is indicated by the fact that the writer was able to procure a very old specimen at Skidegate for the Provincial Museum at Victoria, B.C. This form was also in use up to a late date at nearly all of the Haida villages to show the crest of the occupants of large mortuaries. The only specimen still in existence known to the writer was procured from Skedans by the writer for the Field Museum of Natural History at Chicago. The mortuary form closely resembled that of the large carved chests showing the head of some animal in bold solid work while the limbs are shown on each side of the central head outlined by deep incised work, and all painted in the usual colors. It is clear that Marchand's description of two tablets seen by his party at the west end of what is now called Lucy Island, close to Dadens (Tartanee of Douglas), applies to carvings of this kind. These were eight or nine feet long by five in height, and were made of two planks joined together. Represented on them in red, black and green colors were seen the different parts of the human body covering the whole surface. (Marchand, l.c., p. 295).

Respecting the antiquity of the style of totemic display afforded by the vertical poles, the older Haida say that they are of comparatively recent origin, and that tradition says that they were not made until iron chisels came into use. It is believed that iron tools were unknown to the inhabitants of the north-west coast before the Russians made their appearance in what are now Alaskan waters. This would be about the year 1741. In 1774, when the coast of British Columbia was first discovered, iron tools were noticed by the Spaniards under Perez in the possession of the natives both of the Queen Charlotte Islands and of Nootka. (Documents from the Sutro Collection, Historical Soc. of Southern California, Los Angeles, 1891, pp. 121, 132, 203.) Iron tools were more plentiful, apparently, when Cook visited Nootka in 1778, as he speaks of seeing at this place iron ornaments, arrow points, chisels and knives with thin curved blades. (Cook's Third Voyage, II, pp. 271, 330.) Cook was of the opinion that iron was too common, in too many hands, and its use too well known for the natives to have had the first knowledge of it quite recently or by an accidental supply from a ship. Nevertheless, it was in great demand, and, even in 1789, after free distribution of this material by other traders, Captain Gray of the *Lady Washington* was able to purchase a large number of sea-otter skins at the rate of one chisel each. Already, too, delicate carving on horn and bone was found at several localities.

TOTEMISM AMONGST THE HAIDA.

Crests.—As stated by Swanton (l.c., 107), each Haida family had the right to use a certain number of crests, *i.e.*, figures of animals and certain other objects during a potlatch; or they might represent them upon their houses or any of their property, and tattoo them upon their bodies. With one or two exceptions the two clans already mentioned, the Raven and the Eagle, use crests which are distinct from one another. Of the two sets of crests the Raven Clan, which is considered to be older than the Eagle Clan, uses the killer-whale universally, and nearly every Eagle family uses the eagle.

Of the Raven crests the grizzly-bear is next to the killer-whale in frequency of occurrence, with the rainbow and supernatural snag next in order. Swanton records thirty-three Raven crests in all.

Of the Eagle crests, next to the eagle itself follow the beaver, sculpin, frog, whale and raven in frequency. Swanton lists thirty Eagle crests in all.

Although there are traces which indicate that the personal manitou and the religious ideas of the Haida may have had some part to play in the development of their crest system in early days, at present these influences seem to be very weak, and it has now become a kind of heraldry by which an individual may make known his or her rank and position in the social scale.

Some of the old chiefs say that until of late years totem poles could not be erected by women, but for a long period, only ending with the cessation of the potlatch and the old ceremonial customs, it was not uncommon for the woman's crest to be carved upon her husband's pole and, when her body was placed in a vertical mortuary pole, to have her crest alone in front of her coffin. A fine specimen of this from the Haida village Tanu is in the Museum at Victoria, B.C.

As compared with similar carvings amongst other native stocks in British Columbia, Haida totem poles are, in general, of wider proportions than those of the Nass River and Skeena peoples, Tsimshian, and of more regular lines than those of the Kwakiutl, a people who seem to have a much more grotesque imagination. Of late years the Kwakiutl and the Nootkans of the west coast of Vancouver Island have endeavored to copy the Haida style of carving and examples may now be seen at Nootka itself and at Ehatisett, whilst more numerous specimens have quite recently been erected at Fort Rupert, Gwaestums, Tsatsichnukwomi and Tlaoitsis amongst the Kwakiutl.

LOCATION OF TOWNS AND VILLAGES IN THE OTTAWA VALLEY.

By J. Keele, Ottawa.

(Continued from page 97.)

The Bonnechere river enters the Ottawa about 12 miles above the mouth of the Madawaska, and like the latter has its source in the Algonquin Provincial Park in the Laurentian highland.

The French Canadians, who were always among the pioneers in lumbering operations, called it the river of "good living" or Bonnechere, probably on account of the good quality and quantity of the pine along its banks, the ease of navigation and the abundance of game and fish.

The valley of the Bonnechere is one of the most remarkable physical features of the region and unlike the other tributary streams its valley is deeply indented far into the Laurentian upland.

The physical geography of this valley has never been studied in detail by anyone, so that only the most superficial facts concerning it are known. Its origin and history are certain to furnish interesting and difficult problems to the future physiographer.

The valley is quite narrow in the lower part but above the town of Renfrew it opens out in wide plain-like expanses trending in a northwesterly direction. From 35 to 50 miles west of the Ottawa the valley is occupied by two large lakes, Golden lake and Round lake, which are situated directly on the course of the river. The difference in elevation between Round lake and the Ottawa is about 335 feet. This drop is taken up by five chutes or falls, three of which have towns or villages situated on them. Renfrew is on the second chute, Douglas on the third chute, and Eganville on the fifth chute.

The valley is bounded by escarpments of gigantic rocks, the northern escarpment being comparatively low and broken by smaller tributary and through valleys at several places, but the southern escarpment is a continuous and imposing feature, rising in places to a height of 1,000 feet above the river.

Except perhaps from the top of Mount McKay near Fort William there is not a more spacious view to be obtained anywhere in Ontario as that from the high points of the ridges south of Eganville along which the Opeongo road runs. From any of these points the broad trough of the Bonnechere with its large lakes is seen in the foreground; beyond this are the ridges between the Bonnechere and Muskrat lake valley, then the ridges between Muskrat lake and the Ottawa valley, beyond which is seen the great escarpment of the Laurentian highlands of Quebec 45 miles away. (See fig. 2.)

Renfrew, the largest town in the Ottawa valley had its beginning in circumstances connected with the lumber industry in 1820. The reader is referred to "The Story of Renfrew", by Mr. W. E. Smallpiece, for details concerning the early settlement and history. Only a few references bearing on the particular phase of the development we are considering will be given. "Before 1833, Captain Bell started a mill at Castleford, better known as First Chute. This mill was never a success as it was a difficult place to maintain a dam. In 1834, Messrs. Miller and Carmichael built a grist mill on a little dam on Hurd creek now known as Smith creek. This mill did a thriving business until the establishment of the McDougall mill at the Second chute, now the falls of the Bonnechere in Renfrew town. Before these mills were built the pioneer settlers in the neighborhood had to go to Prendergrasts, on the Quebec side of the Ottawa river with their grists."

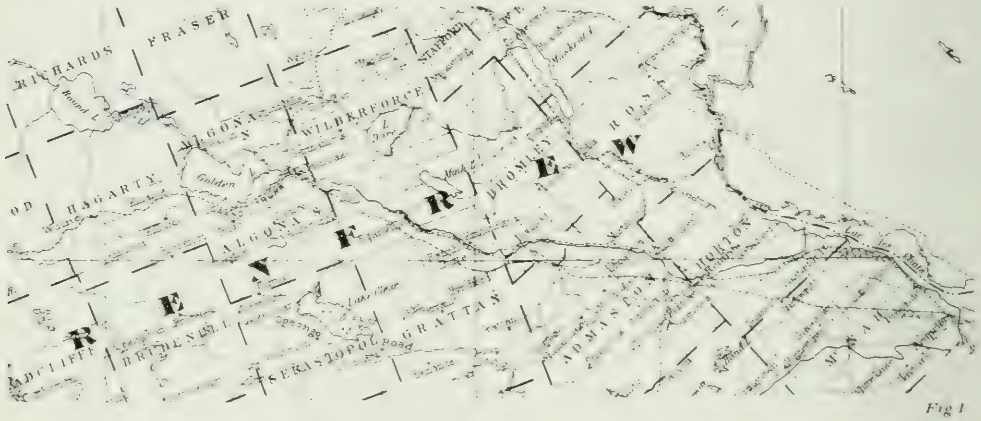


Fig 1

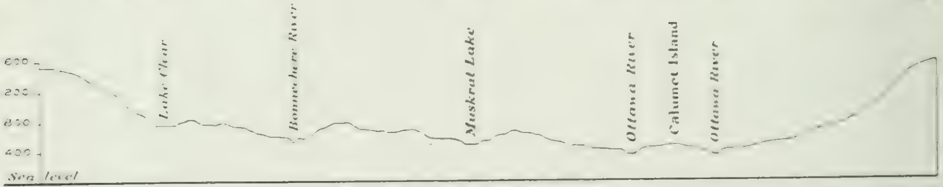


Fig. 2

Fig 1. Map of a portion of Renfrew county, showing the Bonnechere river, and its connection with the Ottawa.
Fig. 2. Section from southwest to northwest across the Bonnechere and Ottawa valleys.

Occasional patches of paleozoic rock, principally limestones and shales, extend up almost to Golden lake, but the rocks on which these were laid down, such as granite gneisses or other igneous rocks, are the ones mostly seen. Bedrock of any kind, however, is seldom observed in the broad valley bottom as there is a great thickness of sandy and stony drift over its whole length and on top of these in the lower portion of the valley is a thick layer of stoneless marine clay, except where isolated ridges of bedrock rise above the clay level.

The oldest and youngest rocks in the world may be seen in contact at the first chute, near Castleford, where the marine clay of late Pleistocene age rests on contorted Grenville limestone.

The principal business during the early development of Renfrew was mainly concerned with lumbering. "To be a lumberman in those days was the supremest height to which business ambition could aspire. The small boys of that day played lumbermen with the same zest and earnestness that the small boy of modern times played circus or railway contractor."

The Opeongo road which leads from Renfrew westward up the Bonnechere valley and over the southern escarpment to the upper waters of the

Madawaska was built both as a colonization road and as a means of transporting freight to the lumber camps. Another highway serving the same purposes was opened up through the level ground of the valley bottom as far as Golden lake.

While the lumbering business was flourishing, the settlement and clearing of land in the neighborhood of Renfrew progressed steadily so that it became a place of some importance as a centre of population.

The first railway reached Renfrew in 1873, and later on we find the Canadian Pacific railway diverting its transcontinental line from the easier route following the Ottawa river to a more difficult one, in order to include the business which the town of Renfrew contributed.

There is a variety of good farming land in the vicinity of Renfrew. The district to the south, between the Bonnechere and Madawaska rivers has an undulating surface mostly covered with a thick sheet of boulder clay, whose weathered surface furnishes excellent soils. West of Renfrew there is a plain two to six miles wide and 12 miles long covered with stoneless marine clay over which the most approved farming machinery can be worked and where there is practically no waste ground (fig. 3). The soils to the north and east in the upland country are lighter in texture but nevertheless support a considerable farming population, on account of the presence of large areas of crystalline limestone underlying the drift.

Samples of the excellent products raised on the varied agricultural resources of this district form the principal attraction at the annual three days fair held in Renfrew exhibition grounds.

When the apparently endless forests of pine had disappeared from the Madawaska and Bonnechere valleys the commercial interest hitherto engaged in the timber trade had to adapt itself to changed conditions.

Flour mills apparently never ceased to operate on the water power at Renfrew from the time it was first used for that purpose.

Two mills producing woolen goods are also located on the river. A brick and tile plant produces burned clay wares from the marine clay which underlies the greater part of the town. This plant has the advantage of being able to produce buff or red brick owing to the fact that the lower part of the marine clay at this point carries such a high percentage of lime that it overpowers the red coloring tendency of the iron content of the clay and imparts a buff color in the burning process. The greater part of the lime has been leached by weathering from the upper part of the clay so that the iron can assert itself in giving the characteristic red color to the burned ware. Tile for draining the nearly level marine clay plain west of Renfrew finds a considerable market over most of this area. Not a foot of this land need be unproductive if it is properly underdrained.

The crystalline limestone in the vicinity of Renfrew has been quarried for building purposes, the post office being an example of its use in architecture. Its glistening white surface will probably keep fresh for a long time in this situation, but in a large city it would soon become dingy.

Quite an extensive use of the crystalline limestone is made in the production of quicklime for building purposes, the lime kilns being situated on an outcrop of this rock within the town limits.

The remarkable mounds of sand, gravel, and boulders and the curious bowl-shaped depressions that accompany them which occur close to the rock escarpment just north of the town are features resulting from glacial ice drainage channels. The kames, as the gravel mounds are called, furnish abundant supplies of material for concrete construction or road-making and are freely drawn upon for this purpose.

All the industries so far mentioned have a purely geographical reason for being at Renfrew, as they make use of the local resources for local needs.

Natural resources such as convenient supplies of material for building purposes, productive land to supply food in abundance, plenty of room for the comfortable housing of labor, together with water powers are geographic advantages which tend to the growth of industries in the region.

The possession of these resources with the aid of transportation facilities offered by two lines of railway have made it economically possible to establish at Renfrew industries using raw materials like iron and coal which have to be hauled for long distances.

The power furnished by the Bonnechere river proved in time to be inadequate to the increasing demands made upon it and one of the waterpowers of the Madawaska river was recently developed in order to supply the deficiency as well as provide for future needs in power. The rapids at the outlet of Calabogie lake on the Madawaska river were used for this purpose, the distance between this point and Renfrew being 15 miles.

DOUGLAS.

The village of Douglas is on the slope of a low ridge on the north side of the valley of the Bonnechere, 12 miles west of Renfrew. The river comes close to the foot of this ridge and flows over outcrops of shaly limestones in a series of rapids and falls with a total descent of 27 feet.

A wide depression tributary to the Bonnechere valley runs northward from Douglas and forms a large part of Bromley township. This depression is floored with stoneless marine clay, its surface standing at a slightly higher level than the clay plain in the Bonnechere valley into which it merges. The length of the combined clay plains from Renfrew to the furthest point in Bromley is 20 miles and its widest extent is 6 miles. The greater part of this land was sown with spring wheat in 1918 with excellent results.

Douglas is a small trading and social centre for the neighboring farming community. Its situation on the southern slope of a low ridge overlooking the valley makes it a desirable site for residential purposes, but it is doubtful if it will expand industrially owing to its proximity to Renfrew.

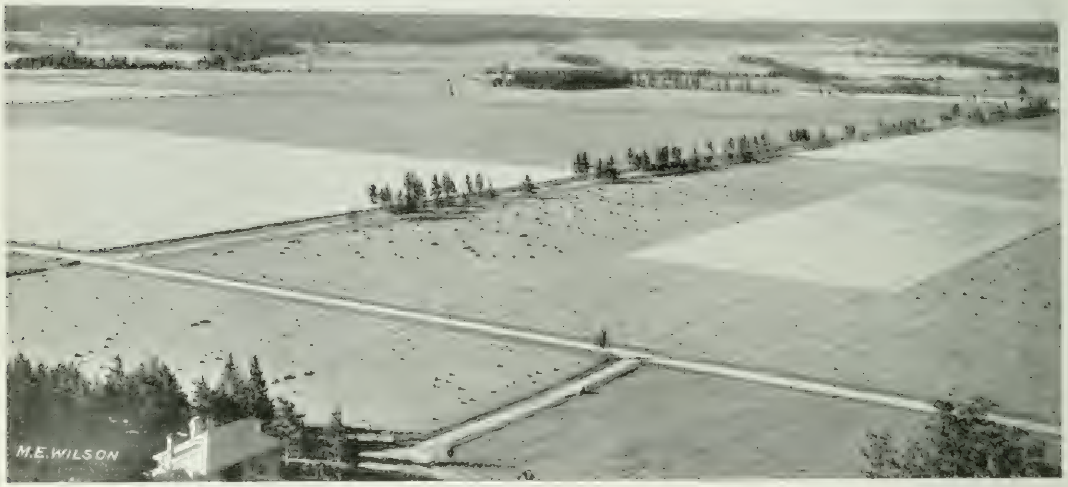


Fig. 3. The highly cultivated clay plain west of Renfrew, looking toward the southern upland border.

The clay land extends a few miles west of Douglas, but only in a very narrow strip along the river banks and ceases entirely near the fourth chute.

There is an extensive sheet of glacial outwash gravels at Caldwell station on the Grand Trunk railway four miles west of Douglas. The railway company has worked out a large excavation in using these gravels for ballast, so that good sections showing their character and structure can be observed.

FOURTH CHUTE.

At the fourth chute the Bonnechere river makes an abrupt descent of about 38 feet over ledges of flat lying limestone. A portion of the water above the falls finds its way down through lines of weakness in the limestone formation. By the processes of erosion and solution the running water has enlarged its passages until a considerable volume now issues from a cave on the north side of the river a short distance below the foot of the falls. There are a series of lofty caves in the cliffs below the falls, in addition to the one through which the stream discharges and probably formed in the same manner.

The lower limestone beds in the cliff are shaly in characted and consequently very friable and easily worn by the action of running water. The upper beds are less easily disintegrated being massive and more compact in texture, and these form the roofs of the caverns.

Masses from the upper beds, however, are continually falling, according as the lower shaly beds on which they depend for support become undermined by the water. The river breaks up the fallen masses and disposes of them within a comparatively short time, so that quite an ampitheatre has been carved in the cliffs in post glacial times.

These caves are an impressive example of the rapid erosion of comparatively soft rocks by running water, and the process is here revealed by which the removal of the greater part of the vast layer of paleozoic limestones and shales which formerly existed in the Bonnechere valley was effected.

EGANVILLE.

Eganville the ultimate village in the valley is situated on the fourth water power of the Bonnechere river, 23 miles west of Renfrew.

Mr. Alexander Murray, of the Geological Survey, when making the survey of the Bonnechere river, in 1853, mentions Mr. Egan's farm at Eganssville as growing excellent crops of wheat, oats, hay, potatoes, and other roots, besides having raised a large stock of horses and cattle. The country generally, however, throughout the whole region was essentially a lumbering rather than an agricultural district. Mr. Murray states, that "although the greatest part of the timber on the main river has long since disappeared—a large portion having been swept away by fire, independent of that removed by trade—there are still vast quantities brought down the river annually and made to descend to Ottawa by the course of the Bonnechere. On our way up the stream, we repeatedly found it almost entirely blocked up with squared timber, sometimes for miles together."

Eganville depends to a very small extent now on the lumber industry, being mainly a trading centre for the surrounding farming communities.

A large mass of boulder clay blocks the valley of the Bonnechere at this point, and the river has cut down through it to a depth of 40 feet. Good sections of this stony glacial clay are seen on the north side of the river just behind the post office. The business portion of the village is situated alongside the river in the bottom of the cutting and the residential section is on the terraces. Wooden stairs are used as short cuts by the residents when passing from one level to the other.

The soils derived from the boulder clay in the vicinity of the village are very productive, but further south the soils become more sandy in texture being derived mostly from fluvio-glacial sands and gravels. The presence of numerous rock ridges further curtail the agricultural possibility in this direction.

A curious condition due to glaciation on the slopes and top of the high southern escarpment is worth considering in more or less detail, as it concerns the geography of the district. The continental ice sheet moved nearly from north to south in this region so that it crossed the broad trough of the Bonnechere nearly at right angles. There was probably a considerable extent of the comparatively soft, flat lying paleozoic rocks consisting of limestones and shales, eroded from the valley bottom. The wet ground products of these made by the weight and movement of ice were carried along and plastered over the southern slope of the escarpment. This material contained a good percentage of clay substance and subsequently made good soils which were tilled wherever the slopes were not too steep. On the steeper slopes a magnificent crop of hardwood has grown up whose broad expanses of flaming color is one of the many atractions of the region every autumn.

The flat lying limestones and shales extended up the valley only a short distance beyond Eganville in pre-glacial times, so there was very little clay making material gathered up by the ice when passing this portion of the valley, consequently where the clay making materials cease in the valley the clay soils cease in the escarpments to the southward and are replaced by those of sandy texture.

Fifty years ago or thereabouts many people from middle Europe emigrated and settled in this and other parts of Ontario. A number of Germans and Poles were settled on the lands south of Eganville. It was the irony of fate that the people of that distressed country Poland were settled on the sandy portion of the escarpment and valley while the Germans were placed on the lands with clay soils.

The area lying between Wilno, Rockingham, and Barry Bay in Hagerty and Radcliffe townships is included in the Polish settlement. A great portion of this land is made up of porous gravel and sand heaps, mostly glacial moraine features (fig. 4) the remainder being rock ridges with thin sandy soils.

This district is mostly absolute forest land, unfitted for the cultivation of crops. The employment afforded by the lumber companies, however, enabled the Poles to maintain their existence in the face of great natural disadvantages.

Although the lands of the German settlement in Sebastopol township had a great deal of clay soils, the glaciation also brought along numerous boulders, which were strewn over the surface. With unremitting industry the men, women, and children of the community have cleared the fields from stones so that crops can be sown and harvested by machinery.

In recent years Eganville has become an important shipping point for live stock.

Owing to the uneven character of the surface and the spotted occurrence of land fit for cultivation, the farmers in this part of the Bonnechere valley frequently have considerable areas of wild land at their disposal. These lands are a source of fuel, pulpwood or cedar timber for posts, or grazing lands for cattle and sheep.

In some instances several adjacent farms have been entirely withdrawn from cultivation and the whole fenced in and used as a cattle ranch. The hay cut from beaver meadows and swamps in the vicinity is largely used for winter feeding for these cattle. This kind of farming is particularly well suited to the upland region remote from the railways as it is easier to have the crop walk down to the shipping points than it is to haul other produce over the hilly and poorly maintained roads of the region.

Kilns for the burning of limestone are located on the bank of the Bonnechere river a short distance below Eganville. The flat lying beds of the paleozoic limestone which outcrops at this point are used for this purpose. Large quantities of quicklime produced at these kilns have been shipped as far as Toronto.

BONNECHERE VALLEY ABOVE EGANVILLE.

The boulder clay soils do not extend very far west of Eganville but become merged into sandy types, the soils becoming more sandy and gravelly going westward, except in the wide flat portion of the valley between Golden lake and Round lake. This part of the valley is underlain by silt, and is productive and permanent farming land, but is restricted height of 400 feet above the water borders the northern shores of the two lakes and the intervening in area. A steep walled escarpment rising to a silt plain. The extensive upland north of the escarpment is composed of solid granite gneiss ridges without a particle of limestone and absolutely bare of soil. It is one of the most repellant and barren districts in the region. now that it has been denuded of its forest covering.

A few settlers endeavor to cultivate the sandy and gravelly lands around the shores of Round lake, but settlement practically ends here. The few habitants who live west of this depend largely on the chase of the fur-bearing and other animals which incautiously venture outside of the sanctuary of the Algonquin Park.

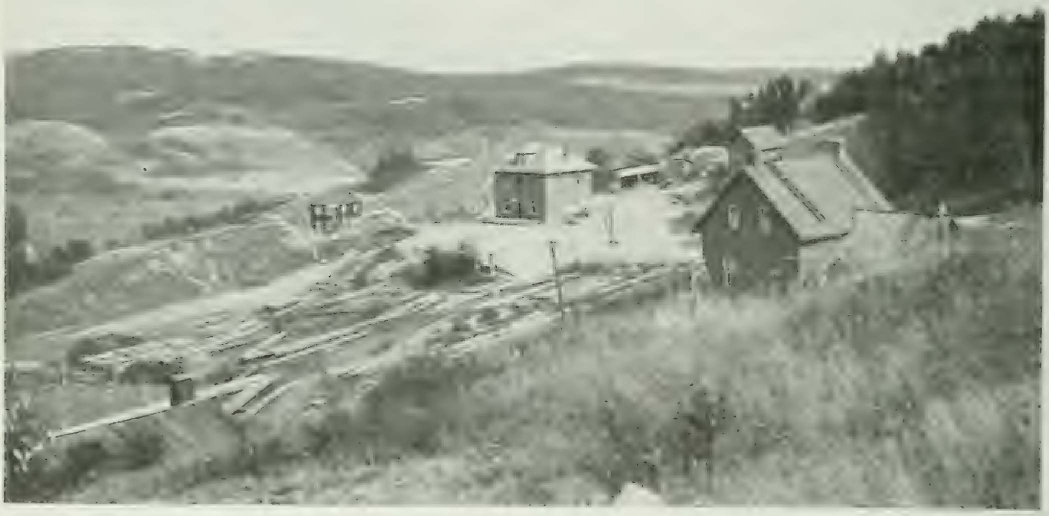


Fig. 4. Wilno station on the Grand Trunk railway. The bare hills are mounds of fluvio-glacial sands and gravels unfit for the cultivation of crops.

Killaloe station on the Grand Trunk railway, 16 miles west of Eganville and near the south shore of Golden lake is a small local trading centre, but the most of the business of this part of the valley is tributary to Eganville.

RAILWAYS.

A branch of the Grand Trunk railway coming westward from Montreal through Ottawa enters the Bonnechere valley at Renfrew. This line, originally known as the Canada Atlantic, was constructed during the years 1892-97 for the purpose of assisting lumbering operations in the highlands between the Ottawa and Muskoka waters, and also as a link in a grain carrying route from the west having a terminus at a port on the Georgian Bay.

There is an easy grade up the bottom of the Bonnechere valley but on leaving the valley to go westward the escarpment presents serious difficulties to railway construction. The highland is reached, however, by taking advantage of a gap or depression, known as the Hagerty pass, which occurs just west of Golden lake.

This pass is about 300 feet lower than the general elevation of the upland. Its sides are lined with a series of mounds and ridges of gravel and sand of glacial origin, between which there is room for a railway line (fig. 4). The railway line leaves the valley bottom at Killaloe and reaches the summit of the pass two miles west of Wilno station (fig. 1).

The distance between these two points is 10 miles and the difference in elevation is 425 feet. The railway would have obtained a route over the highland without this heavy grade by following up the Madawaska river from Arnprior, but it was more desirable to divert the line into the Bonnechere valley so as to secure the business of the towns and villages located there.

Although the ridges and valleys in the Laurentian highland taken in detail or in small groups appear to have no definite arrangement or trend, yet it is clear that the main drainage streams are flowing in a valley or series of valleys in echelon, having a general northwest-southwest direction.

Railway lines have no difficulty when proceeding in these directions but the nature of the surface as indicated above is unfavorable to lines which depart from the trend of these controlling features.

(To be continued.)

RANDOM BOTANICAL NOTES.

II. L'ISLET COUNTY, QUEBEC.

BY BRO. M. VICTORIN, LONGUEUIL COLLEGE, QUE.

While engaged in studies preliminary to the building up of a detailed flora of Quebec, the writer felt very keenly the lack of information concerning the limit reached along the St. Lawrence river by a number of boreal and halophytic types.

He then proposed—and it was his good fortune to realize—a collecting trip to L'Islet, a small riverside town situated about fifty miles below Quebec city, and fifty miles above Rivière-du-Loup. Both Quebec and Rivière-du-Loup having been repeatedly visited by trained botanists, it was thought that a visit of a few days half-way between these two places would furnish valuable data on that semi-halophytic section of the St. Lawrence river. Consequently, the last week of August, 1916, was devoted to botanizing in the region.

The district consists of a narrow plain bordering the St. Lawrence river and limited on the southeast by a central highland which slopes gradually into the valley of the St. John river. The highland which has an average elevation of about 1000 feet above sea-level, is sharply separated from the plain by a prominent fault escarpment. The rocks are mainly red and green shales, black shists interbedded with quartzites, the assemblage of these being now known to geologists as the Islet formation.* Furthermore, the peculiar quartzites and conglomerates known as the Kamouraska formation are also represented by a few detached hills standing prominently over the country.

Botanically, it was found that the shore line and the occasional protruding Cambrian rocks thereon were unusually interesting, but in the interior of the country, on account of its being thickly settled at a very early period, little of interest was noted.

The waters of the St. Lawrence river are still practically fresh at L'Islet. Off shore, however, the sodium chloride is noticeable at high tide. I have heard it said that water drawn from the river does not freeze easily in winter and is worthless for skating rinks, these facts pointing to the presence of a small percentage of sodium chloride.

The beach flora as it could be observed at this late season was composed in the main of nearly pure strands of *Scirpus americanus* Vahl., and *Zizania aquatica* L., the former being especially important there as a turf-forming species. Among other hydrophytes of interest were noted the following:

Scirpus pauciflorus Lightf.,
Phragmites communis L.,
Juncus Dudleyi Wiegand,
Juncus nodosus L.,
Juncus bufonius L.,
Triglochim palustre L.,
Potamogeton bupleuroides Fernald.,
Potamogeton epihydrus Raf.,
Heteranthera dubia (Jack.) MacM.,
Iris versicolor L.

Iris versicolor as it occurs on the shores of L'Islet, Trois-Saumons and Saint-Jean-Port-Joli is a rather perplexing plant seeming to verge toward the American form of the boreal and coastal *Iris setosa* L. In these localities the range of both species may overlap and the hypothesis of hybridism naturally presents itself to the mind. However, Dr. M. L. Fernald tells us he has observed similar forms of *Iris versicolor* far from the range of *Iris setosa*.

As far as our observation goes the only halophytes to reach so far up the St. Lawrence river are the following:

Ligusticum scothicum L.
Ranunculus Cymbalaria (Pursh.) Greene,
Solidago sempervirens L.

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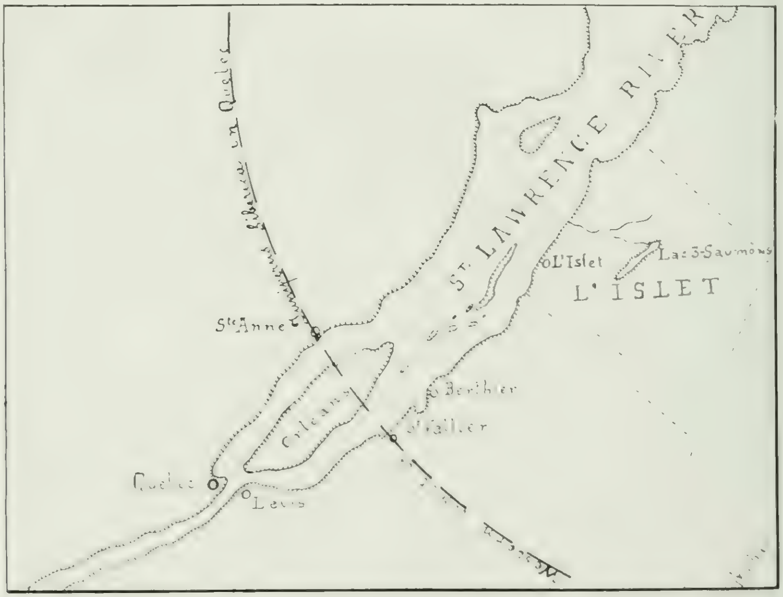
*Dresser, J. A., Reconnaissance along the Transcontinental Railway in Southern Quebec. Geological Survey, Memoir No. 35.

The range of the halophytic goldenrod is thus notably extended westward. On the other hand, *Ranunculus Cymbalaria* was to be expected as it is sometimes found inland; Bro. Rolland has recently met it near Ottawa city. To this small list of halophytes must surely be added *Plantago decipiens* Barneoud, which we collected twenty-five miles above L'Islet, at Berthier-en-bas. The Berthier locality is exactly half-way between L'Islet and the city of Quebec.

L'Islet owes its name to an isolated outcrop of conglomerate and limestone protruding from the muddy shore. The very short distance beween this and the mainland has been bridged by the wharf which furnishes easy access. A few hundred yards above, a geologically similar mass, but much smaller, emerges from the water. It is locally known as "Rocher Panet." The hollows left in the matrix of the conglomerate by the weathering of the dolomite inclusions, have given rise to a legend which any genuine L'Isleter will tell you.

Rocher Panet has yielded more than a surprise to us. *Astragalus alpinus* L., var. *Brunetianus* Fernald was a thing most interesting with its fine young fruit, while *Agalinis paupercula* (Grey) Britton in full flower occupied an extensive patch. The latter is apparently new to Quebec. But the climax of the day was reached when we found, hidden among tall grasses, a good number of late specimens of the little-known *Gentiana nesophila* Holm.* This plant had been hitherto recorded from Anticosti, the type locality, Newfoundland and the Mingan Islands. There was, however, in the Gray Herbarium an old record: "Quebec, 1860, Dr. Charles Pickering," which, owing to what was known then of the range of the species had always been suspected as far as locality was concerned. The discovery of *Gentiana nesophila* at L'Islet gives full authority to the Pickering label and we may consider this lovely gentian as fairly frequent along the St. Lawrence river from Quebec city to the Gulf and Newfoundland.

Thus roused to a high pitch of enthusiasm by the treasures of Rocher Panet we crossed to Rocher de L'Islet with unbounded ambitions, which, however, were only partially satisfied. At this late season of the year, many of the early floristic elements had withered beyond recognition, but we were able to collect the following:



Map of L'Islet and vicinity, Quebec.

Selaginella rupestre (L) Spreng.,
Juniperus horizontalis Moench.,
Rosa blanda Ait.,
Campanula rotundifolia L.,
Scutellaria parvula Michx.,
Euphrasia canadensis Townshend.,
Potentilla pectinata Raf.,
Draba arabisans Michx., var. *orthocarpa* Fernald,
Rumex maxicanus Meism.,
Cerastium arvense L.,
Woodsia ilvensis (L.) R. Br.,

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*For description of the plant see The Ottawa Naturalist, Vol. 15, p. 111

We have previously hinted that nothing of more than usual interest was found inland, from the St. Lawrence to the height of land. Special attention was devoted to the collecting of *Euphrasia* which is abundant everywhere, but all the material secured turned out to be *Euphrasia canadensis* Townsend.

Near the shore, *Aster longifolius* Lam., the commonest of the genus along the lower St. Lawrence was found abundantly with here and there the bulky heads of *Angelica atropurpurea* L.

In a vale between two small and dry quartzite hills, the predominant plant was an extraordinary luxuriant goldenrod. Dr. M. L. Fernald, to whom the plant was referred, does not think it, however, to depart materially from the ubiquitous *Solidago canadensis* L. More experience with the goldenrods has convinced the writer that this species hybridizes more freely than is generally believed, and this may account for many of the unusual forms it assumes.

Lake Trois-Saumons is a romantic expanse of clear water lying in a trough of snow-white quartzite at about 1500 feet from sea-level. The lake is well-known for its being much spoken about in a book favorite with the French Canadians: "Les Anciens Canadiens," by Philippe-Aubert de Gaspé. Botanically, it has no outstanding features, for, *Chiogenes hispidula* T. & G., *Viola incognita* Brainerd, *Lycopodium clavatum* L., *Epipactis decipiens* (Hook.) Ames, *Dryopteris spinulosa* (Muell.) Kte. var. *intermedia* Underw., *Solidago macrophylla* Pursh. are familiar things in the northern woods.

The lake, encased in a rock very resistant to weathering, is remarkably free from mineral and organic debris, and altogether most unfavorable to the development of plant-life. *Juncus brevicaudatus* Fernald, *Carex Crawfordii* Fernald, *Potamogeton ephydrus* Raf., and an emersed form of *Callitriche palustris* L., were the only species noted, and even these were in no way common.

One of the plants whose distribution is considered to be typical of that of a group of many others in the St. Lawrence valley, is the shrubby *Juniperus sibirica* Burgsd. Though present in the valley of the Ottawa river, at least from Ottawa upwards, it has not, as far as we know, been recorded between Ottawa city and the Island of Orleans. In eastern Quebec, the westernmost stations known are those of Saint-Cyr and Provancher: east end of the Island of Orleans and Sainte-Anne de Montmorency, respectively. On the south shore there was no satisfactory record. We then profited by the opportunity offered of an auto ride from Lévis to L'Islet to watch the prostrate patches which are so conspicuous objects where they occur. The result of the survey was that *Juniperus sibirica* begins to appear at Saint-Vallier in the county of Bellechasse, exactly where the red shales of the Sillery Cambrian crop out. It is to be observed that Sainte-Anne-de-Montmorency, Island of Orleans and Saint-Vallier lie in a straight line perpendicular to the trend of the St. Lawrence river. We may then trace with more certainty than before a part of the curve that encircles the wide gap existing in the range of *Juniperus sibirica* in Eastern Canada.

BIRD LIFE IN THE BERMUDAS.

By CLARENCE B. HUTCHINGS, OTTAWA.

The Bermudas are an ideal sanctuary for birds. These subtropical islands, some 300 or more in number, situated in the North Atlantic about 670 miles S.E. of New York, form a group of very charming and picturesque low-lying lands for the most part covered with junipers *(Juniperus bermudiana)*. They are specially interesting for their wealth in bird life. There conditions are right from the standpoints of food, climate and protection for a great variety of the wild birds of North America. The many flower gardens in which roses of all kinds, lilies, begonias, crotons, oleanders, palms and the like, bloom luxuriantly all the year round are a special attraction; the mangrove *(Rhizophora mangle)* glades; the juniper groves; the huge Pride of India trees *(Melia azedarach);* the wide spreading tamarinds *(Tarmarindus indicus);* the highly coloured poincianas *(Poinciana regia)*; and last, but more important than all these, the orchards and numerous fruit and truck gardens where luscious fruits such as grapes, figs, mulberries, pomegranates, sugar apples, Surinam cherries (*Eugenia micheli)*, etc., hang in tempting bunches, free and open to all passers-by. Altogether this forms about as happy and rich a hunting ground for birds as one can well imagine.

The climate, too, is favourable. For the greater part of the year the weather is delightfully mild, the thermometer seldom going about 86° F. in summer and never below 48° F. during the coldest days in

February. The average mean annual temperature can be safely set down as 70° F., which figures, together with the above, may be verified from government meteorological reports.

But these are not the only advantages that our birds enjoy on the islands. There is one still to be added and it is that of a good and wise protective legislation which, it may be said with pride, is most rigidly enforced throughout the whole colony.

Here, then, is truly a garden of Eden for birds, an avian El Dorado, a haven of bird bliss, a veritable ornithic paradise. It is, therefore, not surprising that millions of birds visit these islands every year on their flights north and south at two periods of migration, some to remain for only a few hours, others to stay for months at a time.

About the beginning of March the returning tide of bird life commences to set in strongly from the South. The first arrivals are for the most part waders and shore birds, such as the curlews, plovers, sandpipers, snipes, etc. They are exceedingly shy, and one can seldom view them well except from a distance, as they run up and down hurriedly along the smooth edges of the sand beaches in search of food in the thick beds of brown seaweed which the tides have washed up in great quantities. A little later on toward the end of March or beginning of April, numbers of herons, cranes and ducks pass by, and about this time one may see night hawks skimming swiftly over the low marshes and swamps just about the dusk hour. Next follow the spring birds of the woods and orchards; the scarlet tanagers, the indigo birds, the rose crested grosbeaks and the American cuckoos. These last remain a great part of the summer and although not often seen, their joyous call may be heard in the quiet dells and woody hillsides of the country. Then come the long list of summer birds, among them being the cardinals, kingfishers, bluebirds, mocking birds, woodpeckers, warblers, finches, tropic birds, and a host of others too great to mention here.

The tropic birds (*Phaeton americanus*), or longtails, as they are called on account of the one long white feather in the tail, come to stay throughout the entire summer. They can be seen in countless numbers at certain places where they assemble every year to nest, flying up and down, up and down, ceaselessly in the bright sunshine, all day long, constantly on the lookout for fish. A great number of the summer visitors stay behind during the warmer months of June, July and August to brood, and their presence in the parks, gardens and orchards as they flit here and there, gives one a source of real joy and happiness. Among these may be mentioned the cardinals, catbirds, rice buntings, bluebirds, finches, vireos, humming birds and many others.

The ground doves, (*Chaemepelia passerina*), are indigenous to Bermuda. They are like miniature pigeons, very compact, soft grey in colour, with blue black spots on the wings; short bare legs, feeding on small seeds and insects, gregarious in habit, and always on the ground. Their note is a low, sweetly-plaintive coo, similar to that of the ring-dove. They are very tame, but if disturbed suddenly they quickly rise, making a strange beating sound with their wings and fly to some other spot nearby. The goldfinshes (*Carduelis carduelis*), found so plentifully throughout the islands, although not natives, have become established there within the last 25 years. It happened that a passing vessel put into St. George's harbour for repairs, and while there, by some chance a large number of finches on board were liberated. These birds flew to the mainland, to Castle Harbour, St. David's Island and the neighbourhood, and found there a most hospitable refuge in the wooded dells and quiet, secluded places where they settled. Since then they have spread to all other parts.

The noisy, chattering, ubiquitous house sparrow is there in flocks of thousands. It is without doubt the most undesirable immigrant and a source of great annoyance to all who own fruit and vegetable gardens. These birds were introduced many years ago by Mr. Thomas Reid, a prominent citizen of Hamilton, who conceived the brilliant idea of importing several pairs of sparrows in the hope that they would be of great benefit in controlling insect pests. He lived to regret this, for the birds multiplied prodigiously and soon flocked into his lovely gardens and ate up the sugar apples, cherries and grapes, doing incalculable damage. They played havoc with crops everywhere, attacked and killed many of the native birds. The Legislature passed laws to destroy the pest. Rewards were offered for collecting the eggs. However the sparrows could not be done away with and to-day are as great a nuisance as ever. Undoubtedly they are the worst enemy of the song birds. It is not an uncommon sight to see half-a-dozen pugnacious cock-sparrows attacking a cardinal; the result is generally the death of the songster.

A large number of the feathered visitors, apart from their beauty and song, are of the greatest economic importance and benefit to the farmers and gardeners. Some feed exclusively on seeds during winter, like the shore larks and sparrows; others, such as the woodpeckers, nuthatches and warblers prefer insects only; the cuckoos find the hairy caterpillars a palatable dish. Bluebirds are indefatigable grub hunters. The white-eyed vireo *(Vireo griseus)* or chick-of-the-village, as it is called, is another very valuable insect destroyer. It has the habit of alighting on the twigs of trees, swaying head downwards in every direction like an acrobat, jumping and flying from branach to branch, catching many an unwary insect as it goes. The catbird is very fond of small fruits, especially grapes, strawberries and cherries, the last being particularly relished. It repays for any pillage, however, by eating its full share of grubs and worms, occasionally favouring with a song.

Few countries, if any, offer better protection to bird life than Bermuda. Shooting is strictly prohibited. No one on the islands is allowed to possess firearms of any kind. One of the questions asked by the customs official as the newly arrived visitor lands is, "Have you any firearms?" If he has, the weapon is confiscated and is not returned until he departs. Under the Wild Bird Protection Act, any person attempting to shoot, trap, or interfere with the liberty of any of the wild birds (sparrows and crows excepted) is liable to a penalty of $25.00, and the mere fact of possessing a wild bird's egg is sufficient to constitute a breach of the law. Apart from the sparrows and a few hawks, the song birds enjoy comparatively a free and easy time. There are no snakes on the islands to trouble them, and the Bermuda boy, be it said to his credit, seldom robs a bird's nest.

There is much investigational and research work to be done among bird life in these summer isles, and to the ornithologist and student of Nature, Bermuda willingly opens her charming laboratory at all seasons of the year. Those who have taken advantage of this offer often wish to return again to follow up their investigations. The study of bird life is always an interesting one, but when presented under such ideal and unique conditions as the Bermudas offer, it becomes one of special instruction and fascination.

A PROMINENT MUD-CRACK HORIZON OF THE CEDAR VALLEY STAGE OF THE IOWA DEVONIAN.

By Carroll Lane Fenton.

The following notes relate to observations by the writer on a Devonian section showing good examples of mud cracks. This section representing the limestones of the Cedar Valley stage is exposed in the southeast quarter of Section 20 St. Charles township, Floyd county, Iowa, in two small quarries known as the Bloody Run quarries.

The section which the writer obtained at these quarries combined with an earlier section by Mr. Clement L. Webster of Charles City, Iowa, is given below:—

		Ft.	In.
16.	Hard gray limestone, partly covered by drift	4	
15.	Hard, fine, buff limestone with casts of a small species of *Naticopsis*, *Athyris vittata* (Hall), *Athyris spiriferoides* (Eaton), *Atrypa reticularis* (Linnaeus), and a small undetermined species of *Spirifer*	1	7
14.	Buff or yellow-buff limestone containing many small or moderate sized nodules and containing *Atrypa reticularis* (Linnaeus), *Athyris vittata* (Hall), and *Spirifer subvaricosa* (Hall), as well as large numbers of undetermined Stromatoporoidea	1	9
13.	Heavy, gray-brown limestone with numerous nodules at base	1	2
12.	Thinly laminated, regularly bedded shaly limestone, buff or yellowish buff and showing throughout strong marks of mud-crack with occasional traces of ripple mark	1	6
11.	Regularly bedded, hard limestone of light yellow or buff color with bedding planes showing very distinctly on weathered faces. Upper part crowded with many very small concretions	1	8
10.	Yellowish buff, hard limestone, almost, if not entirely unfossiliferous with the upper portion crowded with small dark concretions	7	
9.	Thinly and evenly bedded, yellowish to brownish limestone, apparently without fossils	3	
8.	Gray brown limestone, in even beds of three to six inches no fossils observed. Contains some calcite	2	3
7.	Yellowish brown or dark buff limestone, weathering to very thin layers. Contains fragments of *Spirifer* sp. (undet.)	3	10
6.	Coarse heavily bedded yellowish limestone	3	

5. Yellow unfossiliferous shaly limestone	1	4
4. Hard, brittle, unfossiliferous grayish limestone	1	6
3. Limestone similar to the above in appearance, but very shaly		10
2. Thickly bedded gray buff limestone	1	2
1. Heavy yellowish buff to brownish limestone very coarse and apparently unstratified. Porous with large amounts of calcite, and often much broken in portions, unfossiliferous. To bed of creek	3	1

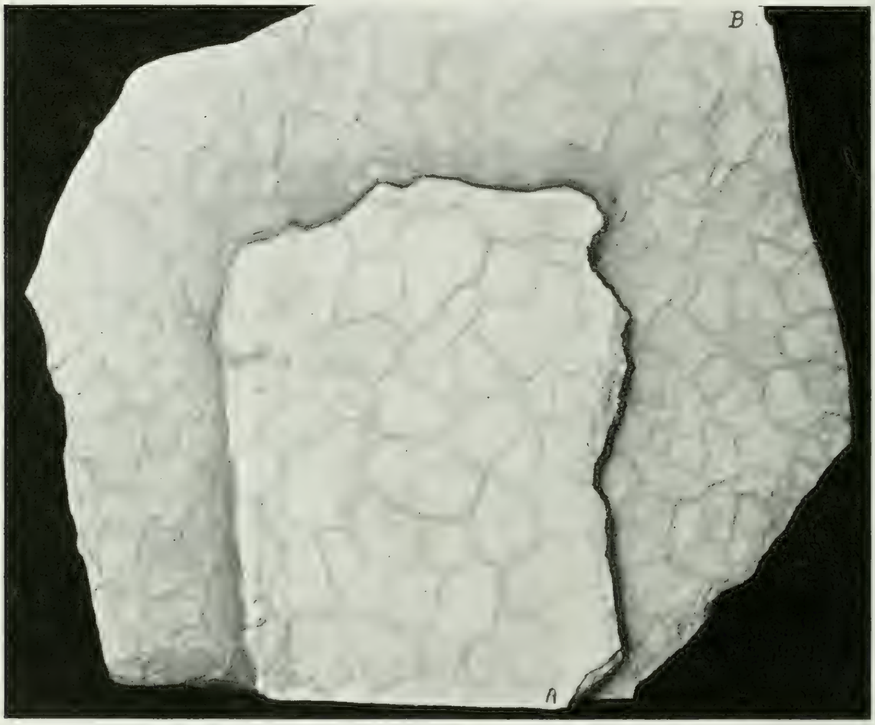

Fig. 1. A and B—Mud-crack; the smaller specimen (A) shows the first type; the larger one (B) shows that of the second. Specimens in collection of Carroll Lane Fenton.

Bed number 12 of this section has the widest extension of any mud-crack horizon of the Iowa Devonian known to the writer. It is found at various points east of Charles City, at Devonia, in the north part of Floyd county, at and near Osage and Mitchell in Mitchell county, and in other localities in the northern portion of Floyd as well as in portions of Cerro Gordo and Worth counties (C. L. Webster). At Waterloo, in Blackhawk county, it is a continuous horizon, and south of the State Teachers' College at Cedar Falls it is also well developed and has a good exposure on the bank of a small creek. The characters at these localities are practically the same as those shown at the Bloody Run section and the relative position is the same. In Charles City the mud-crack horizon may be found in places below great beds of the stromatoporoids and beneath the water level of the Cedar river. At Cedar Rapids, in Linn county, the writer observed what was taken to be a continuation of this horizon though he can make only a provisional statement that it occurs there. Mr. Webster considers that this horizon extends even to the south of Cedar Rapids.

The most satisfactory localities for the study of this horizon are the two Bloody Run quarries. The bed in these quarries has been exposed for a long term of years and the underlying rocks have so broken away that large specimens can be secured with comparative ease. The horizon at this point consists of two quite distinct divisions. The lower of these is of extremely thin bedded shale. The polygons are of large size from two to six inches at greatest diameter and the interspaces are often one-fourth to one-half an inch wide (fig. 1, A). The edges of the polygons are often very decidedly downwarped and in the specimen figured this characteristic is well developed.

The second type (fig. 1, B) is one of smaller polygons of more regular form with the greatest diameter ranging from three-fourths of an inch to two inches. The bedding is somewhat heavier and occasionally the stone bears a trace of ripple mark. The surfaces of the polygons are as a rule nearly flat; the down warp is apparent in only the larger of them.

The figure shows two specimens of mud-crack from this bed. The smaller (fig. 1, A) is of the first type; the larger (fig. 1, B) of the second. Both are from the same large slab.

Using the experiments of Dr. E. M. Kindle,* in his study of the formation of mud cracks, as a basis for his deductions the writer concludes that at the beginning of the period during which these cracks were formed the water was of a higher degree of salinity than that of ordinary sea water. The larger cracks of the lower portions of the beds show that at first the process of desication was more rapid than it was during the time when the upper portion of the horizon was laid down. The conditions affecting dessication, however, were not entirely stable for layers immediately above the large specimen figured contain cracks that average a larger size. The conditions as a whole, however, were fairly uniform and the changes were gradual. The mud was probably of a marly character.

It is impossible of course to make a definite statement as to the cause and conditions of formation of this horizon. The sea bottom was evidently raised over a wide area. The change from normal sea bottom to a wide partially submerged flat was of a temporary character.

NOTES AND OBSERVATIONS.

EQUISETUM ROBUSTUM A. BR. IN ONTARIO.—During the month of November, 1918, a specimen of Horsetail was sent in for identification by Mr. F. J. Perkins, Hope Farm, Kingston, Ontario, which proved to be the above species. Mr. Perkins states that he found it in a wooded lot close to his own grounds.

This species, although known from British Columbia, does not appear to have been found elsewhere in Canada. Dodge's Flora of Point Pelee mentions it as occurring on the small islands near the Ohio shore; it has also been found in the State of New York, which is apparently its northern limit in the east.

J. ADAMS, Division of Botany,
Exp. Farms, Ottawa.

ERRATA.—THE GENUS VESPA IN CANADA. In the typing of my original manuscript of the article which appeared in the October issue of THE OTTAWA NATURALIST, an important couplet relating to the species *consobrina* was omitted. The following corrections should be made:

Page 71, column 2, line 11; for "stipes" read "stripes"; line 18, insert "7" before "hairs."

Page 72, column 1, under "RUFA GROUP" insert the following: "9. Markings white. Male 2068, female 2067, *consobrina*, Ont. to B.C. Sauss. Markings yellow . . . . 10."

Page 72, column 1, line 7, for "9" read "10"; line 23, for "10" read "11"; line 24, for "10" read "11"; column 2, line 20, for "11" read "12"; line 21, for "11" read "12."

F. W. L. SLADEN.

CHIPMONKS; WITH SPECIAL REFERENCE TO THEIR INDIVIDUAL DISPOSITION, CHEEK CAPACITY, AND HANGING ABILITY.—We have two chipmonks at our house, chipmonks which were born on the Fraser plateau of the southern interior of British Columbia, and which were caught in a figure four trap, and transported to a prison camp in Ottawa. Not so much a prison camp after all, as when let out they sometimes go back into the cage to store their gleanings of food. At other times they run over or under us, apparently without the slightest fear, rather than be driven towards the cage. They can stuff seven large kernels of corn in their mouths and hold them in their cheeks.

One of them often watches us, comes to the front of the cage when we approach, eats out of our hand and at times even sits on it when eating. We call him Labor, because he does all the work and loses most of his pay. Some scientists would call him *Labor hustleus*, variety *goodwillie*. The other sulks in a corner, never comes to meet us, seldom eats out of our hand, and always attacks Labor as soon as he has any tidbit. He often takes it away from him. We commonly call him Capital, although known to science as *Capital greedius*, variety *autocratus*.

One morning Labor took a fragment of nut meat from my hand and was fiercely attacked by Capital. He fled to the top of the cage as usual. This is made of wire netting. There he hung by his four feet watching lazy Capital switching his tail in anger, too lazy to pursue him further. Then in order to hold the nut meat with his forepaws, he let go his hold with them and hung free by his hind paws from the top of the cage. Here he hung for some minutes until he had finished his breakfast.

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*Some factors affecting the development of mud cracks, Journ. Geol. vol. 25, 1917, pp. 135-144.

HARLAN I. SMITH.

BIRDS OBSERVED AT THE MAGDALEN ISLANDS IN MONTH OF JULY.—This list was made from memory after leaving the islands, so that other kinds may have been seen which are not mentioned. I was not engaged at anything ornithological at the time, and merely afterwards jotted down the names of the birds I remembered having seen.

AMERICAN ROBIN *(Planesticus migratoria)* may be seen at any time during the summer.

BARN SWALLOW *(Hirundo erythrogaster)*. This bird is in evidence at its nesting time, when numbers are to be seen flying in and out of their nests which are built of mud placed against the eaves of barns and other outbuildings.

HOUSE SPARROW *(Passer domesticus)*. This European intruder had just made its appearance at the islands, and was then already beginning to make its presence felt.

AMERICAN CROW *(Corvus brachyrhynchus)*. Plentiful in the wooded parts of the islands and in the fields.

HORNED LARK *(Otocoris alpestris)*. Very common in July in open fields where the bird builds its nest right on the ground where frequently cows are grazing. In the latter part of July the nesting was apparently about over, but although I could not find the nest with the eggs, I caught a fledgling in the open space where it was just learning to fly.

BELTED KINGFISHER *(Ceryle alcyon)*. A single specimen of this bird was seen at Havre Aubert, Alright Island, which was alleged to have had a nest in an excavation in one of the cliffs, but I did not see its mate.

HUDSONIAN CURLEW *(Numenius hudsonicus)*. Occasionally to be seen along the shores.

GANNET *(Sola bassana)*. The distribution of this bird in the Maritime Provinces is very local, but it is very plentiful at the Magdalens where it is often to be seen resting on the bosom of the sea or on the wing.

PETRIL. (Sp.?) This bird otherwise known by the name of Mother-Carey's-Chicken is in evidence during stormy weather when it may be seen flying over the crests of boisterous waves. Two individuals were seen by me during a storm when about two miles off shore from Old Harry, Coffin Island.

COMMON TERN *(Sterna hirunda)*. May be seen in the summer time flying over the sea at the islands at any time.

HERRING GULL *(Larus argentatus)*. One of the most common of birds at the islands, to be seen either on the sea or on the land near the shore. This gull frequents the maritime coasts throughout the year.

MURRE *(Uria troile)*. Frequently seen either on the sea or on the wing.

BLACK GUILLEMOT *(Cepphus grylle)*. This species is popularly known as the Sea Pigeon and is quite common.

ANDREW HALKETT.

AN ETHNOLOGICAL NOTE ON THE "WHISKEY JACK."—The term "whiskey-jack", locally applied in Canada to the Canada Jay, looks for all the world like a genuine English word. Ingenious theories might be spun as to the origin and applicability of the term. Such theories, however, would be little more profitable than the well-known bit of folk etymology that explains the asparagus plant as "sparrow grass". As a matter of fact, "whiskey-jack" is merely the perverted English form of an Indian original.

In his "Myths and Folk-Lore of the Timiskaming Algonquin and Timagami Ojibwa",[*] F. G. Speck states that "the trickster-transformer Wiskedjak 'meat-bird' is the personified Canada Jay or 'Whiskey-Jack'." He proceeds (pp. 2-16) to give a number of Timiskaming Algonquin tales dealing with this well-known Indian character. The name Wiskedjak occurs in other forms in closely related Algonquin tribes of Canada. In his "Notes on the Eastern Cree and Northern Saulteaux",[**] Alanson Skinner gives further tales referring to the same mythological character. The Northern Saulteaux form is given by him as Wisekejack, the Eastern Cree form as Wisagatcak. Further, we find Wisagatchak stories of the Cree included by Frank Russel in his "Explorations in the Far North."[†] The Algonquin and Northern Saulteaux are to all intents and purposes bands of the Ojibwa, who have travelled north and come into contact with their present neighbors the Cree. The main body of Ojibwa tribes are not acquainted with Wisagatchak, so that it is a fair inference that he is, to begin with, a Cree culture-hero and trickster and that many of the tales told of him travelled to various other Algonkian tribes that neighbored the Cree. It is not at all certain, however, that he originally had anything to do with the Canada jay, as he does not seem to be so identified in all of the tribes, nor does the word itself indicate the jay. Evidently related to Wisagatchak is the Fox culture-hero and trickster Wisahkä.[††] The Fox Indians are now located in Iowa, but originally dwelt along the west shore of Lake Michigan. That the Ojibwa, who occupy territory between the Cree and the Fox, should originally have lacked this character in their mythology is somewhat surprising, but is corroborated by the linguistic evidence, which indicates that the Fox language is more closely related to the Cree than is the geographically less remote Ojibwa. The English term was evidently derived from some Algonkian tribe, in all likelihood an Algonquin or Saulteaux band, among whom the identification of the culture-hero with the Canada jay was current.

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[*] Geological Survey of Canada, Memoir 71, Anthropological Series No. 9, 1915, p. 1.

[**] Anthropological Papers of the American Museum of Natural History, vol. 9, 1911, pp. 83-88 and 173-175.

[†] University of Iowa, 1898; see "Myths of the Wood Crees," pp. 201-216.

[††] See William Jones' "Fox Texts," Publications of the American Ethnological Society, vol. 1, 1907, pp. 229-379.

The meaning of the term Wisagatchak seems to be doubtful. In his "Dictionnaire de la Langue des Cris,"‡ Father A. Lacombe does not attempt to give any etymology for Wisakketjâk, but merely defines the term as 'legendary man of the various tribes of the North, to whom they attribute supernatural power with a great number of tricks, turns, and follies. He is regarded as the principal genius and as the founder of these peoples." What has happened, then, in brief, is that an Indian term of obscure meaning, employed to refer to an important mythological being, was, in a limited area, identified with the Canada jay and that this term was then borrowed by the whites as the common name of the jay and finally refashioned into a make-believe English word.

Curiously analogous is the history of the French word *renard* "fox". This word is not of native Romance stock but is merely a French application of the favorite mediæval trickster Reynard, identified in folk-lore with the fox. The term itself is of Germanic origin and appears in many different forms. Among them are the modern German name Reinhart, and the Dutch and Flemish Reinecke or Reinke.

E. SAPIR.

BOOK NOTICES.

LESSONS ON WEEDS. Manitoba Farmers' Library, Extension Bulletin No. 30. Thirty "Extension Bulletins" have already been issued by the Manitoba Department of Agriculture under the general title of 'The Manitoba Farmers' Library" which is devoted to the extension of information on agricultural and sanitary matters and is distributed free among the people of Manitoba. These bulletins cover a wide field and several of them are of special interest and value to field-naturalists, notably No. 23, "Our Friends the Birds," No. 25, "Gophers and Squirrels in Manitoba," and No. 30, the most recently published, "Lessons on Weeds," a pamphlet of 50 pages and many illustrations. All three of the bulletins mentioned above were prepared for use in the schools of Manitoba but are distributed free to farmers as well. Some fifty species of weeds are described and figured, the descriptions including in most instances notes on the mode of reproduction and very full instructions on the best methods of eradication. Seven poisonous plants are described, including the poison ivy, and it is worthy to note that the only method of eradication mention is to "put on gloves and pull up the long woody perennial roots which creep for yards underneath the leaves." Perhaps the sentences of most value in No. 30 are these:

"Weeds waste water."

"A big weed takes a barrel of water out of the soil."

One has only to realize this and note the rank growth of weeds which so frequently overrun gardens to understand why in dry seasons so many amateurs are disappointed in their garden crops. A crop of weeds means a barrel of water per square yard, or 8½ inches of rainfall. Other provinces might well follow the example of Manitoba in the publication of such bulletins as "Lessons on Weeds" for use in the public schools.

THE HAWKS OF THE CANADIAN PRAIRIE PROVINCES IN THEIR RELATION TO AGRICULTURE. By P. A. Taverner. Museum Bulletin No. 28, Dept. of Mines, Canada, August, 1918. The work before us is one that has long been needed and comes at a time when its authority may prove an important factor in the preservation from extinction of some of our most useful birds. To the reviewer, who has spent much time and labor in an endeavor to show the absurdity of the indiscriminate slaughter of our prairie hawks, this publication is extremely welcome.

As Mr. Taverner points out, we have few really injurious hawks inhabiting the Prairie Provinces and of these but one, the Goshawk, is of sufficient size, or occurs in sufficient numbers, to be of marked importance in reducing our game supply. This hawk breeds but rarely in the southern portions of Western Canada, but when the food supply is scarce in the north invades our territory in considerable numbers during autumn and winter time.

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‡Montreal, 1874.

More than one such invasion has taken place within the last 30 years, and on each occasion there has been a very marked reduction in the number of grouse. This is, of course, not to be wondered at when we realize that a single Goshawk has been known to practically destroy a flock of 50 sharp-tailed grouse during the winter. It is noteworthy that these hawks seldom raid poultry yards and in consequence are difficult to entice within range of a gun, but to those who have had experience, a flock of pigeons have proved to be a useful attraction to lure the Goshawks within range.

It is quite impossible to touch upon all the questions this publication introduces with which in nearly every case, the reviewer is in full accord. It might seem, perhaps, that undue value is attached to the Marsh Hawk which in Manitoba is rather a frequent visitor of poultry runs and moreover, in its juvenile state, when first learning to hunt for itself, destroys many immature grouse. As an adult, however, there is no question of its great value to agriculture.

It is to the buzzards, however, such as the Red-tail, Swainsons and Rough-legged Hawks that we owe our greatest debt. These are truly Gopher hawks and since they apparently kill more than they can eat it is probable that their value far exceeds the conservative estimate placed upon them by Mr. Taverner even though in the case of Swainsons Hawk there are instances of poultry and wild birds having been taken.

As Mr. Taverner remarks, the eagles are rare. They are liable to become still more so owing to the mania for collecting them at every opportunity. So far as their food is concerned, this is made up largely of bush and jack rabbits.

This bulletin is an excellent one carefully prepared and provided with several useful text figures as well as three colored plates showing most of the hawks discussed in different phases of plumage. It should be in the hands of every prairie farmer or sportsman and if carefully read should do much to dispel the prejudices which have been so widespread and which have indirectly been a far greater factor in reducing our crops than is generally supposed.

N. C.

DRAGONFLIES (ODONATA) OF ALBERTA. By F. C. Whitehouse, with two plates of illustrations. This pamphlet of 16 pages, published by the Alberta Natural History Society is a valuable contribution to the entomology of the province. 55 species are listed and a brief description of each given. A key to seasonal distribution is included, also a key to the genera.

TENTH ANNUAL REPORT OF THE QUEBEC SOCIETY FOR THE PROTECTION OF PLANTS FROM INSECTS AND FUNGOUS DISEASES, 1917-1918. This report of 92 pages has recently come to hand. It contains a number of papers of value particularly to the horticulturist or agriculturist, such as "The White Pine Blister Rust in Quebec," by Henri Roy; "Warbles and Bots," by A. E. Cameron; "Ants and Aphids," by Father P. Fontanel, etc. The report is published as a supplement to the report of the Quebec Department of Agriculture.

A. G.

OBITUARY.

ERNEST DOUGLAS WINTLE.

Ernest Douglas Wintle was born at Gloucester, England, June 29th, 1852, and died at Montreal, Que., July 19, 1917, at the age of 65.

In a letter from his sister, we learn that "he was always a lover of natural history", and coming to Canada over forty years ago he kept up his interest developing a good field knowledge in natural history subjects generally, but gradually focusing his attention on birds, and after nearly twenty years' close attention to the subject published his "Birds of Montreal" in 1896; a book that is still our only reliable guide to the birds of that region. Previous to this, Mr. Wintle published several articles on Ornithology in the *Auk* and other journals, but ceased to do active work in this field after publishing his book, though his interest in Ornithology never waned, as is shown by his private correspondence. Mr. Wintle was at one time a member of the Ottawa Field-Naturalists' Club, the Natural History Society of Montreal, the Entomological Society of Ontario, an associate member of the American Ornithologists Union, and one of the advisory council of *Bird Lore*. Mr. Wintle was buried in Mount Royal Cemetery, Montreal.

I am indebted to Mr. H. Mousley, of Hatley, Quebec, for permission to use information contained in letters written to him by friends and relations of the late Mr. Wintle.

J. H. F.

(The November number of The Ottawa Naturalist was mailed on Dec. 18, 1918.)

A SUCCESSFUL MARTIN COLONY.

THE OTTAWA NATURALIST

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BIRD-HOUSES AND THEIR OCCUPANTS.*

By P. A. Taverner.

Like Desdemona, we "have a divided duty". On the one hand to cultivate the land cleanly, and on the other, to attract birds to it. These are opposed duties. If we cut the dead wood from our wood lots, parks, and groves; clean out, sterilize, and fill rotting spots in limb and trunk with concrete, we deprive many birds of nesting facilities. If we clear out tangled brush, cultivate to the fence lines, open the ground about young, second-growth plantations, and drain the last marshy spots, we deprive many of necessary cover and the food that goes with it. Insect, weed, and small mammal pests may be reduced; but so, inevitably, will the birds as well. The consequence is likely to be that, whilst our control of pests on the whole will be better, we shall be subject to occasional sporadic outbursts of species that are not subject to these particular methods of control. Whilst the study of their food habits may suggest that birds do not usually partake largely of those insects (for example, the potato bug) whose numbers commonly assume plague proportions, it is also evident that insects that birds systematically feed upon, rarely become plagues. We know, to our sorrow, the few instances where our control is inadequate, but we have no means of knowing the innumerable cases where it has warded off disaster.

The real value of birds as guardians of our fields and gardens is not in the individual species but in the aggregate, each filling its own narrow field, yet all combined, covering every weak point. The swallows hawk through the upper air; the vireos, orioles, and tanagers haunt the tree tops; the woodpeckers and chickadees, the limbs and bark crevices; whilst thrushes examine the debris of wooded grounds and the sparrows and meadow larks scour open fields and shrubbery tangles. In fact at no period of their life cycles are insects free from avian attack—flying, creeping, hiding or buried in the ground or in solid wood—there are species of birds fitted for and eager to attack them. Should any one class of these, our unpaid assistants, be prevented from functioning, an opening is left in our defence that may be an Achilles' heel to our undoing. If we turn our woods into groves, meadows into lawns, and tangles into formal shrubbery something of this sort is possible, unless compensations are provided. In the home grounds and city streets and parks the ideal of clean cultivation is most nearly approached and here it is the more necessary to provide artificially the necessities of bird life that are missing.

Bird boxes will largely compensate for natural cavities in trees and carefully selected plantings of shrubbery and decorative flowers in naturalistic design will supply cover and fruit and seed food. If we fortunately succeed in reducing insects to a point dangerous to bird welfare the deficiency can be supplied by scraps of animal matter presented at feeding stations, on shelves, or in shelters. In these ways only can we partially compensate for our interference with the natural scheme and retain wild birds under conditions of high cultivation. Incidentally, as the home lot is the first to be made atractive to birds, we draw their interesting personalities close about us, and in place of having to tramp miles to their secluded haunts, decoy them to our very windows where they can be enjoyed practically continuously instead of occasionally, intimately instead of distantly, and at ease instead of by exertion. Any one of the methods above suggested requires, for intelligent development, a paper to itself; and the first, only, the building of bird houses and boxes, will be here discussed.

The first thing to consider in building a bird box is the species for which it is designed. Each has its own requirements and though its necessities are more or less elastic the more nearly we fulfil the bird's ideal the more successful we shall be in getting it to use what we provide. In short we must cater to the customs and idiosyncrasies of our tenants and not to our own ideas of convenience and beauty. It is only after the former have been fully met that we can indulge the latter. This does not necessarily mean that taste and ingenuity in the designer is an objection, but only that the fundamental rules of art govern bird house building as well as more serious architecture—that the structure must first be adapted to its intended use and that beauty that interferes with this use is false art and bad architecture. A shingled cottage built to look like a mediaeval castle is bad taste, and a bird house in too close imitation of a city hall, viewed by the canons of pure art, is equally questionable. Artistically, the most successful bird house is the one, which, while fulfilling the practical bird requirements, retains pleasing lines and agreeable surfaces but looks frankly what it is—a house for birds and not a toy human habitation.

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*Published by permission of the Geological Survey. Illustrations by courtesy of the Geological Survey.

THE PURPLE MARTIN.

Probably the bird most generally welcomed about the home is the Purple Martin. This is our largest swallow, comparable in size to the omnipresent, English, or, as it is more correctly named, House Sparrow. In colour, the adult male is all black with steely and purple reflections that give the species its name. The female and young male are almost black above with slight indications of iridesscence, dull or dirty grey below, almost white on the abdomen, and darkest across the breast. The forehead is greyish, leaving a contrasted dark bar from the bill through the eye, bounded below by the lighter throat.

Esthetically, the Martin is a joy forever. Its deep throat gurgles and soft warblings fall pleasantly upon the ear. Unlike those pests the Grackles its voice is never raucous or harsh, nor has it the egg-stealing proclivities of those clownish rascals. Misguided people will occasionally be found who object to having their morning's rest broken even by Martins. Doubtless such folk would object to being awakened by a symphony orchestra. They should be pitied rather than blamed; but, in either event, disregarded. To my mind the soft morning chorus of the Martins is soothing and does not disturb rest; but is conducive to a luxurious semi-consciousness or borderland to sleep that permits the enjoyment of slumber without awakening.

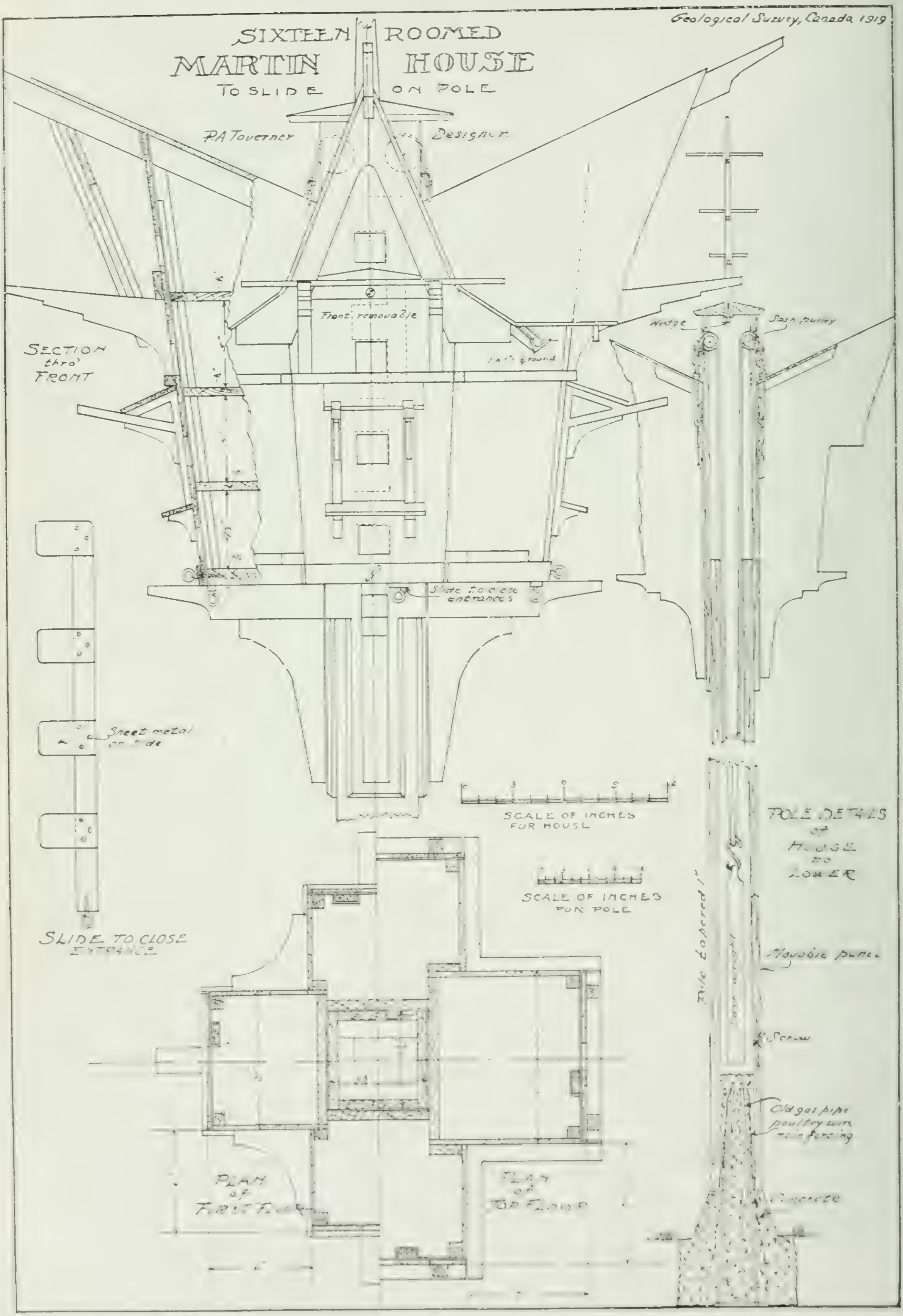
Martins are companionable. They live together in colonies, visit each other's housekeeping establishments, and chatter together continually. The new comer is greeted pleasantly and the departing guest sent on his way with good wishes and merry quips. Visitors from other colonies are received and permitted to peer in and examine the growing families with the expressed satisfaction and approval of all concerned. The greatest good nature prevails. Though passing differences of opinion may occasionally occur and be argued loudly and vigorously, they are rare and do not interfere with the general harmony of the colony. It is only when strangers of other species intrude that all unite to eject them. The House Sparrow is on its best behaviour on the premises and even the family cat walks with circumspection, retreating hastily if not gracefully to the nearest cover at the first assault of the angry birds. In fact such open rough and tumble warfare and tumult is not to the cat's liking and it usually prefers a considerable detour to crossing the open under a thriving Martin colony.

Martins have a strong love of home, and certainly develop a sense of proprietorship, almost human, in the house they are accustomed to occupy. The occupation of a new house already in the possession of Sparrows or other birds, is seldom insisted upon, but on return in the spring to an ancestral home, intruders are positively and rudely ejected. Sparrows, being already on the ground and choosing the most desirable locations before most migrants arrive, often succeed in fighting off other more desirable tenants or even jumping the claims after they have been established by legal possession and labour, but the Purple Martins are a match for sparrows nearly every time, though, like law-abiding citizens, they rarely lay claim to more than they have legal title to. Another point of interest in regard to Martins and their attachment to their home, is the fact that they return to it after its use as a nursery is past. Other birds, probably all other Canadian birds, evince no interest in a nest after the young have left it, at least until a new nesting season recalls it to use. With them the nest is not a home or a shelter, but merely a receptacle for holding eggs and young, useless and without interest when that use is accomplished. Martins, however, retain possession until they gather for the fall migration, and the old homestead remains the family meeting place until the time of departure comes. After the middle of August, though through the day the Martin house may stand empty and silent, towards evening the whole joyous colony regather about the home of their late infancy and family associations. They clatter, gurgle, and exchange family jokes and affectionate greetings until, as the sun goes down, they crowd into the cubbyholes and the wonder is where so many fully grown birds find room. Their voices grow softer and night and silence steals over all. As daylight comes, awakening chirps are heard, heads appear at the doors, birds emerge, and from the topmost points of the house they roll a vocal welcome to the day. Soon all are displaying themselves to the morning sun, preening and fluffing to let the grateful warmth sink into the base of their plumage. As the sun gets higher they make short flights here and there, amidst a chorus of happy bubbling song. By the time the office man is betaking himself to his daily grind, the Martins bethink themselves of their serious duties of life, and hie away for the day, over marshland and meadow, field and stream, housetops or country, until evening again calls them together. Such are some of the attractions of Purple Martins and the tale is not nearly exhausted.

Purple Martins are the only birds we have that will occupy a nesting box in colony. Other birds that can be induced to come to artificial nest receptacles are solitary in their breeding habits and impatient of close neighbours even when of their own species. Hence it is useless to build bird houses of more than one compartment for other species than Martins. The rooms should be about six inches square and about the same height. A little more or less either way will not matter, but these sizes should be approximated. The rooms should be entirely separate from each other and not intercommunicating. They should be light, be draught and weather-tight and have only a single entrance each, which may be either round or square, one and three-quarters of an inch and about one or one and a half inches up from the floor. This last is important. A perch or shelf, outside, on the level with the entrance, is objectionable as the young come out on it before they can fly, and the natural crowding for position is certain to precipitate some to the ground. Such occurrences cause great disturbance and anxiety to the whole colony, but I do not think that the unfortunate victim of the accident is ever fed or raised, even if the commotion does not attract the watchful cat. A perch somewhat below the door, wide enough to comfortably hold one or more grown birds, is desirable, as Martins love to sit about, and the more perches and shelves there are for this purpose, the better they seem to like it and the more attractive the colony is both from their viewpoint and ours. The doors should be sheltered as much as possible by over-hanging eaves and porches. Driving rain beating into the nests of young birds is a deadly enemy and, probably on this account, the best sheltered entrances are most in demand. In the house in the frontispiece the two upper floors are always most in demand. Consequently, since the picture was taken, additional porch shelters have been placed over the lower entrances and it is expected that these will make them more popular. The whole house should be covered with a good, tight, weather-proof roof. Dampness means cold and that is death to young birds. It is also most advisable to arrange the house to open so that after the birds have left for the winter the rooms can be thoroughly cleaned out. During the infancy of the young, a certain amount of house cleaning is attended to, but later the birds have no time for such drudgery, and the debris from a couple of season's occupancy will leave little room within. The house should be erected in the open, away from trees, or at least as high as the top of closely adjoining buildings. Ordinarily it should be from fourteen to twenty feet from the ground, depending on surroundings, high enough to allow free flight and manœuvering room about it.

The materials of which the Martin or any other bird house can be made may be varied to suit taste or opportunity. Lightness, however, is desirable, especially in a large house or in one that has to be supported on a long unbraced pole, in the open, in wind and storm. Light pine, 3/8 or 1/2 inch thick is usually sufficient. For paint, it should preferably be dressed, but rough stuff takes stain better and is more in general keeping. The house in the frontispiece was built of beaver-board—a heavy cardboard—on a wooden frame and the roof and exposed surfaces covered with cotton well painted down. It has been up two seasons now and shows no signs of deterioration that a brush-full of paint will not remedy. Probably a better material is the light wood of which orange crates are made. It would probably be well to give the house a good coat of black paint inside to prevent the light from glowing through it. The support is a built-up box pole hollow in the centre and set on a concrete base, as shown in the details accompanying. The house itself slides up and down the pole on counter weighted cords running over common sash pulleys in the top of the pole, with a heavy window weight inside. A bag of sand would do as well for the latter. This allows the house to be easily lowered to remove trapped sparrows or to be cleaned. Access is gained to the weight box inside through a removable section near the base.

These are about all the rules necessary for the erection of a successful Martin house. It may have as many rooms as desired, the more the merrier, and the larger the colony may grow, but there should at least be several; for Martins are sociable and love the company of their kind. Bearing in mind these requirements and the principles of good taste previously mentioned, there are no reasons why a Martin house that will be a constant source of pleasure to the neighbourhood may not be built by almost anyone. After such a house is once erected, about all that can be done is to await its occupation and meanwhile keep the sparrows out. They will invariably occupy it if not prevented. One good way to exclude them is to arrange entrances that can be easily closed from below. Should sparrows


Geological Survey, Canada 1919
SIXTEEN ROOMED
MARTIN HOUSE
TO SLIDE ON POLE
P.A. Taverner Designer
SECTION thro' FRONT
Front removable
1x1" ground
Slide to close entrances
Wedge
Sash pulley
Sheet metal on side
SLIDE TO CLOSE ENTRANCE
SCALE OF INCHES FOR HOUSE
SCALE OF INCHES FOR POLE
POLE DETAILS OF HOUSE TO LOWER
Pole tapered 1"
Movable panel
Screw
Old gas pipe
poultry wire reinforcing
Concrete
PLAN OF FIRST FLOOR
PLAN OF TOP FLOOR

then get in the door can be closed and the entrapped occupants destroyed. It is said that sparrows so caught can be released again after a period of confinement and that the house is a trap to them thereafter, and their fear of it will be communicated to their companions. Though this may be true, for it is not out of keeping with the intelligence of our rowdy sparrows, who at times show an almost uncanny ability to take care of themselves, I will not personally vouch for it. A dead sparrow makes no nests, of that I am assured and I proceed accordingly. Where it can be used, a .22 rifle with shot cartridges is the most satisfactory sparrow eradicator. Its range is short and its fine shot harmless at very limited distances. In the hands of a man of ordinary intelligence it is to be highly recommended. Sparrows, however, soon grow very wary, precipitately retreating at sight of a man with a gun in the distance, only to return to hurl derision, from the bird house peak or entrance, at their baffled enemy. In such a case a set gun discharged from ambush is very effective. A couple of stakes driven into the ground within range of the perch usually occupied, nails for barrel and trigger-guard from which to hang the gun aimed at the spot, and a long string to the trigger passing through screweyes to an ambush, form an engine of destruction that will effectively discourage the wariest and most persistent of sparrows. It is of proved effectiveness against that last pair that continue to baffle more open methods.

If fortune smiles Martins may come the first spring, but if she is fickle it may not be until the second or even the third season. It was the third season before the writer got Martins in his house and then only a single pair came. What appeared to be a lonely female arrived first. The place seemed to appeal to her and she tried to induce friends to come with her. She would sit on the gable end and call vainly to them. Then, somehow, she succeeded in bringing a committee of investigation back with her. They swarmed all over the house, into all rooms, talking and criticizing and making comparisons. I gathered that one did not like the plumbing, some objected to the decorations, and others to the view, in fact none seemed satisfied enough to move in and after emphatic expressions of opinion all left; the single would-be tenant loudly protesting and vociferously calling them back. When she saw that they were actually deserting her off she flew after them and eventually brought them back for a fruitless reconsideration. Later she was joined by a mate—a juvenile or last year's male similar to herself in plumage—and they settled down to home-making by themselves. Through the brooding season friends from other colonies came and visited and it was no uncommon sight to see ten or a dozen Martins taking an active and personal interest in the growing family, and when the young came out sometimes as many as twenty birds circled about the house. The next spring five or six pairs were in possession and the colony's welfare was established and has increased until, last summer, about twelve compartments were occupied.

As a rule, except where neighbouring colonies are broken up and made homeless, newly erected houses are filled by the overflow from neighbouring ones. Martins are conservative and probably as long as they can find satisfactory quarters in their ancestral mansion are loath to move to strange surroundings. The beginning of new colonies, therefore, depends upon the number of house-hunting birds in the neighbourhood.

SINGLE ROOM HOUSES.

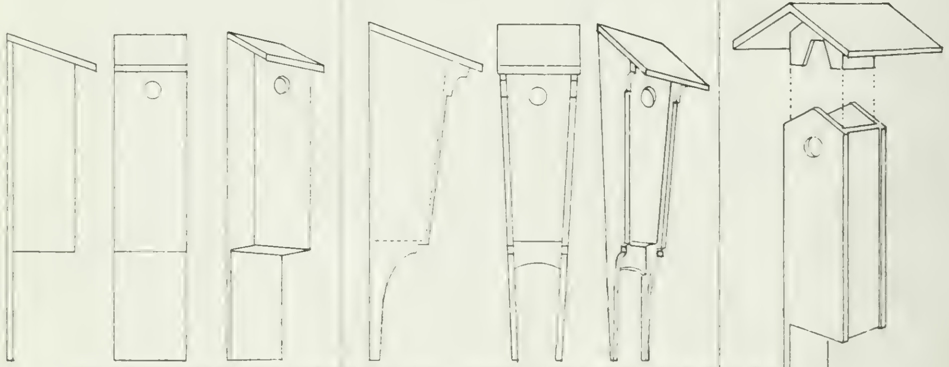
In the following table the birds that can usually be induced to occupy nesting boxes are listed and a schedule is given of their specific requirements. Various ideas as to the forms that may be adopted to fulfil these requirements can be obtained from the accompanying plates.

	Floor size inches	Depth inside inches	Entrance from floor inches	Diameter of entrance inches	House from ground feet
Purple Martin	6x6	6	1-1½	1¾	14-20
House Wren	4x4	6—8	1-6	⅞	6-10
Tree Swallow	5x5	6	1-6	1½	10-15
Blue Bird	5x5	8	6	1½	5-10
Crested Flycatcher	6x6	8—10	6	2	8-20
Chickadee	4x4	8—10	8	1⅛	6-15
Flicker	7x7	16—18	16	2½	6-20
Screech Owl	8x8	12—15	12	3	10-30
Sparrow Hawk	8x8	12—15	12	3	10-30

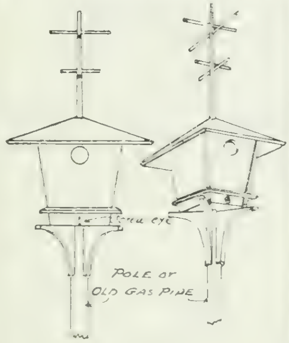
HOUSE WREN.

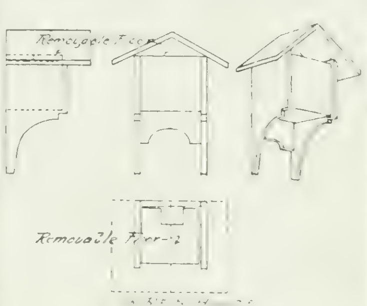
The bird most easily attracted to a bird house is the House Wren. Its tastes are so catholic as to raise the suspicion that it has no taste at all, or that it is so busy with other people's business that it is unmindful of its own. Anything that has an entrance and is hollow, that it considers safe from cats, and that can be filled with sticks, is taken on occasion—an old boot nailed up, a tin can, or even the pocket in an old coat have been repeatedly used. It is the only bird house that can be easily guarded from sparrows, for a small entrance ⅞-inch in diameter will serve the wren and keep pests out.

The House Wren is a busy mite and the wonder is that so small a body can contain such an amount of nervous energy. It may contain but it cannot hold it long, for every few moments it seems to

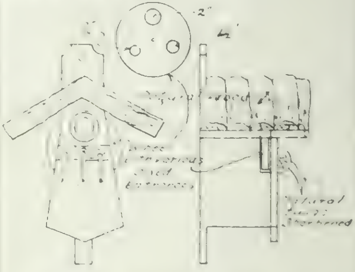


These boxes can be made wholly or in part of waste mill slabs with bark on

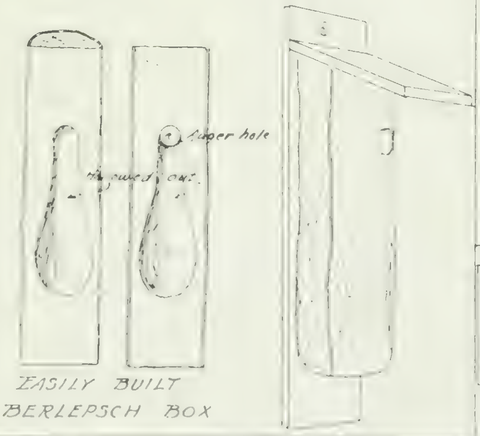

Screw eye
POLE or
OLD GAS PIPE


Removable Floor
Removable Floor

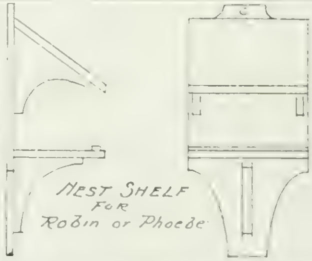
Floor removable to clean



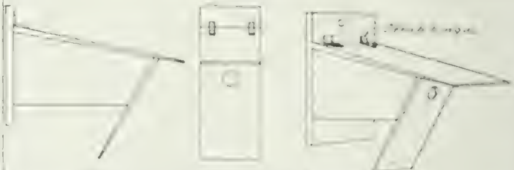
POLE WITH VARIOUS SIZED ENTRANCES FOR DIFERENT SPECIES.


Auger hole
Hollowed out

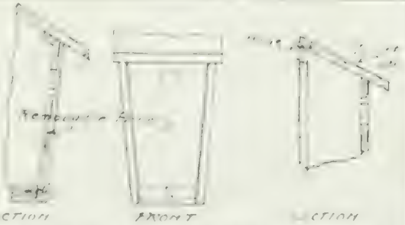
EASILY BUILT BERLEPSCH BOX



NEST SHELF FOR Robin or Phoebe



BOX MADE OF SHINGLES
Supposed to be cat-proof


Removable Floor
SECTION
FRONT
SECTION

SUGGESTIONS FOR OPENING ARRANGEMENTS.

By following this table of sizes the above boxes will suit any of the following birds

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	6 × 6	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CRESTED FLYCATCHER	6 × 6	[illegible]	[illegible]	8	8 – 20
CHICKADEE	4 × 4	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	6	6 – 20
SCREECH OWL	8 × 8	12 – [illegible]	3	[illegible]	[illegible]
SPARROW HAWK	8 × 8	12 – 15	3	12	10 – [illegible]

Geological Survey, Canada 1919

boil over with bubbling song with notes falling over each other in an attempt to get all out at once. It is a prying little busybody and not a nook or corner escapes its small inquisitive eyes and very little in the insect line its sharp, delicately tapered bill. Through the currant bushes it climbs and peers under every leaf, along every twig, then into the raspberry patch, down through the trellis and into the dark recesses of the phlox and larkspurs. The fence next receives its attention and every crack and joint is examined. Perpendiculars and horizontals, right side up and upside down are all one to it, gathering a worm here, a caterpillar there and spiders everywhere; and as it goes it scatters its bubbling song all over the garden. A flutter-budget and a Paul Pry, a busybody and a scold, but withal an important ally of the gardener.

I wish this were all I could say of it, but candor makes me issue a note of warning. If there are other small birds nesting near-by, watch the Wren closely. It is also a serious mischief-maker. This may be a trait of individuals, as there are rascals in all stations and walks of life. I hope it is, for Wrens have been known on more than one occasion to steal into the nests of other birds and puncture the eggs there. They do not eat the eggs, but seem to destroy them out of pure gnomish maliciousness. One is in a quandary whether to admire the little indefatigable caterpillar destroyer and merry songster or to wage war on it as a wanton destroyer and an enemy to husbandry.

TREE SWALLOW.

The Tree Swallow is dressed in a panoply of gleaming steel and white. All above is iridescent black with snowy white below. The female is similar, but with colours less pure and gleaming. Normally the Tree Swallow nests in old woodpecker-holes, in dead trees, preferably overhanging water, but always in the open. Its sweet little "*chink a chink*", like water dripping into a quiet pool, is a pleasant sound and the gleam of its wings in the bright sun adds a most attractive presence to the garden. It has no bad faults that I have discovered and the number of insects it takes is considerable. The house should be on a pole in the open and from ten to fifteen feet up, though greater heights are not necessarily objected to and the box can often be set up from the house top if no more intimate situation is available.

BLUEBIRD.

John Burroughs has described the Bluebird (the eastern species) as "The sky above and the earth beneath", and the description fits it perfectly. All above is iridescent cerulean blue and the throat, breast and most below dull earthy red—"the good red earth". It is another bird above reproach and the brilliant coat of the male, its mate's more subdued colours, its pensive notes, "*purity, purity*," and its modest liquid warble are additions to any landscape. Its nest requirements are quite similar to those of the Tree Swallow, except that it does not nest as high, often occupying holes in old fence posts not five feet from the ground and it is not specially partial to the vicinity of water. I advise every one to get a Bluebird to nest in the garden whenever possible. I have not succeeded in doing this yet, but in the less urban situations it should not be a difficult species to entice.

CRESTED FLYCATCHER.

About the size of a sparrow but with a longer tail. Wood browns above with a slightly reddish tail, grey throat and breast, and pale lemon yellow below; sexes alike, combined with a number of peculiar but not inharmonious whistles, these are the characteristics of the Crested Flycatcher. It is not very often that it comes to nesting boxes, but the unexpected sometimes happens and the writer has had this bird in his garden for two years—not consecutively. The first year of the Martin colony, when it consisted of only a single pair, Crested Flycatchers occupied the wing of the house opposite the Martins. Battles royal occurred constantly, but one was as stubborn as the other and both remained. With a larger colony of Martins the Flycatchers would have stood little chance. The Flycatcher's box should be ten to twenty feet up and if it is partly sheltered by trees as on the edge of a grove it will more closely approximate the natural habitat.

FLICKER.

The Flicker is a woodpecker and about as large as a robin. Valuable for itself it is still further useful as a provider of nesting holes for innumerable other birds. In fact the greater number of our hole-nesting birds, unable to excavate for themselves, are largely dependent upon holes made and abandoned by the Flicker. A Flicker box should closely approximate the nest he makes for himself—the Berlepsch type hollowed out of a section of solid wood is the best. He is perfectly able to make his home for himself and is, therefore, not bound to accept such makeshifts as other species are sometimes forced to put up with. It will be noticed by referring to the drawings that the cavity is gourd or flask-shaped with a round bottom. This type is not difficult to make. A section of natural trunk is first split and the two halves hollowed out with chisel and gouge to match and then firmly nailed together. A board on the top forms an entrance shelter and prevents rain from draining down the joint. The nest should be placed rather high, preferably facing outward from the edge of a tree or trees.

SCREECH OWL.

The Screech Owl is not a common habitant of our gardens, but it is often found nesting in neglected orchards where hollow trees give opportunity. It is a small owl, not greatly exceeding a robin in size, but of apparently greater bulk on account of its heavier build and more fluffy feathering. Its colour may be a fine pattern of either ash grey or burnt sienna red, with prominent ear tufts and yellow eyes. It is carnivorous of course, and undoubtedly takes a certain number of small birds, though mice form its principal fare. On the whole, it is much more a friend than an enemy of man. It may sound inconsistent to allow a bird of prey to build in the garden, much more to advocate building a nest box for it, but it is an attractive little fellow with many pretty ways. It is a gross libel to call it "screech" owl for whatever its song is it is not a screech, but a very pretty whistled tremolo, and as soothing a sound as can be imagined. If one can be induced to stay within easy hearing distance from the house, its many other conversational themes will well repay the listener for his attention and will add an interest to the night that other bird voices give to the day. But if the owl interferes with other song birds? Well, it is mostly after mice and prefers them when it can get them; besides Martins, and other birds that can be coaxed into boxes, are probably safe inside when the owl is hunting. I would really hate to have to choose between a Screech Owl and the other birds—Martin colony excepted of course. Almost any one can have wrens and swallows in the garden, but the presence of a Screech Owl gives a cachet of distinction that I would hesitate to relinquish. To fall asleep at night to the love making song of the Screech Owl, to be awakened in the morning by the pleasant gurgles of Purple Martins and pass the day to the songs of wrens and voices of Tree Swallows makes a modern commonplace garden approach in some degree at least that from which we are supposed to have fallen.

SPARROW HAWK.

The Sparrow Hawk is hardly to be classed as an inhabitant of the garden. The smallest of our hawks, scarcely larger than a robin, and the brightest coloured of all our raptores, the blue blood of the falcons runs through its veins. Such a bird cannot be expected to confine itself to the formal restrictions of suburban life. Its home is the open fields, and there it combats grasshoppers and mice in true knightly fashion. Its chateau is in some high flung limb of a tall dead tree. As a nobleman of the old regime it cannot be expected to descend to the manual labour of the carpenter's and mason's trade, but inherits its residence from that useful commoner the Flicker, in whose abandoned or pre-empted stronghold it raises the cadets of its line. With all its nobility or perhaps because of it the Sparrow Hawk is still man's humble though often misjudged friend and it slays the grasshoppers and small mammal dragons of husbandry without let or stint. Though in the east there is probably little need to erect special quarters for it, as its natural habitat is still well supplied with suitable stubs, on the prairies of the west such accommodation is lacking, and it is often driven by necessity to occupy such prosaic sites as telegraph poles. Think how hard pressed a noble falcon must be to descend to such plebian usage; but *noblesse oblige*, and for the sake of the family line pride is swallowed. In such localities it is a sentimental and esthetic as well as an economic duty to provide this brave little fellow with facilities in keeping with his needs and traditions. The Berlepsch house is the best type and it should be erected as high as possible, over or near what shrubbery is available.

INSECT GALLS AND GALL INSECTS.

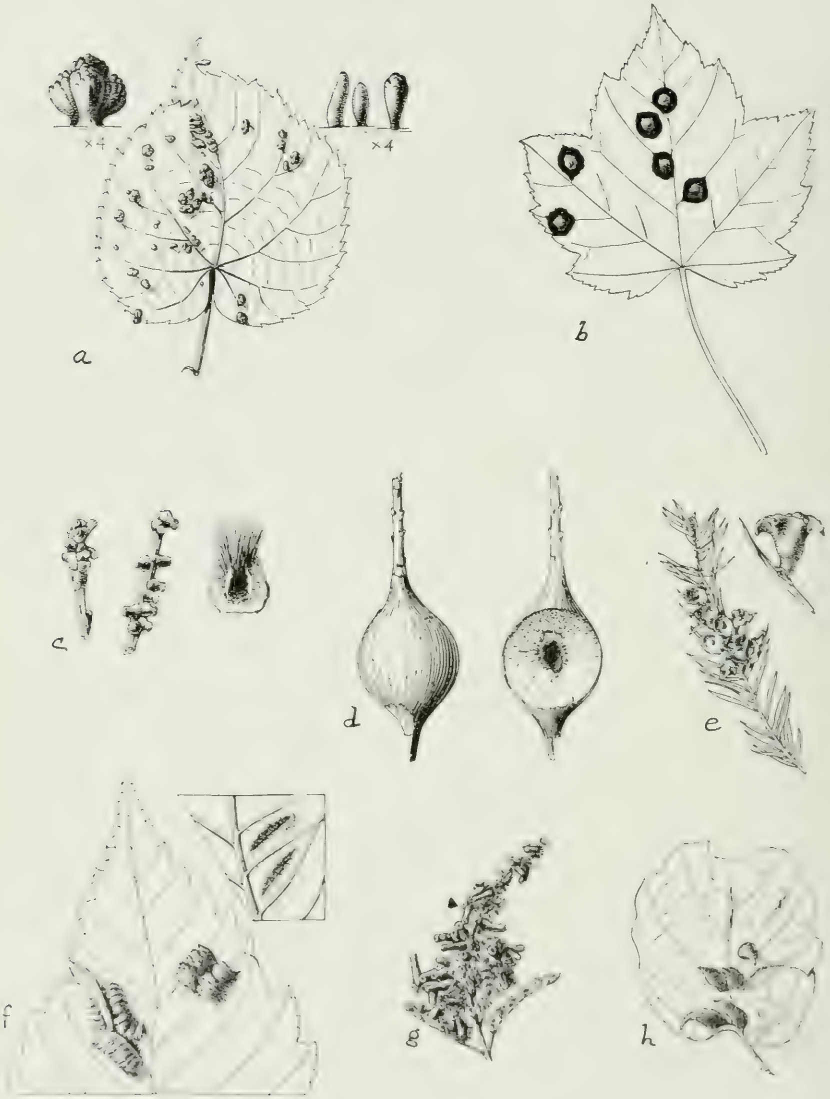
By E. P. Felt, Albany, N.Y.

Insect or plant galls are the obvious and manifold deformities found upon all parts of a great variety of plants and usually given only a passing thought. Gall insects are the inhabitants of these insect or plant galls and, like the deformities themselves, are myriad in number, variety and structure. Insect galls are easily studied, since they are to be found at all seasons of the year and are readily located and preserved. Conversely, while gall insects exist throughout the year and in various stages, practically, it is difficult to obtain them except after some knowledge of their habits and the conditions which are necessary to complete their changes or transformations. Many issue direct from their galls and are easily reared, others enter the soil for the final transformations and are difficult to rear.

The oak apples are moderately common plant galls, occasionally being so numerous as to occur by the hundreds upon favoured trees. They are spherical, an inch or so in diameter, depend from leaves or twigs and are easily crushed. These curious developments are comparatively well known, though the little four-winged gall wasps issuing therefrom are very rarely seen by other than the professional entomologist. It is not so generally realized that there are over 350 different galls produced by various gall wasps upon our oaks and moreover that considerable series of these insects exist in two very different forms, namely, a perfect or complete generation, represented by males and females and usually appearing in midsummer or when warm weather is very favourable to insect activities, and the imperfect or incomplete generation, represented only by females, which issues from a very different gall, usually in early spring at a time when cool, inclement weather seriously restricts insect activities. This remarkable difference between parent and offspring is known as alternation of generations and may be summarized by the statement that it means dissimilar children and similar grandchildren. The great difference obtaining between the two generations is illustrated by a British oak apple which develops on the tips of the twigs and produces four-winged gall flies, whereas the alternate generation issues from masses of somewhat fig-shaped root galls and is wingless. In other words, the wingless insects issuing from root galls climb the trees to the tips of the twigs and those developing in galls at the tips of the twigs, although provided with wings, descend to the ground and make their way to rootlets before they deposit eggs. It is an interesting migration from one extremity of the tree to the other. The peculiar relationship existing between many of the oak galls has been worked out for the European gall wasps, though as yet little is known concerning our very numerous American forms. It is not so very difficult to ascertain this, since it is only necessary to collect the mature galls, keep them under approximately normal conditions in a jar or other cage and when the flies appear give them a chance to follow their instincts under as nearly natural conditions as possible, or better still, if small oaks be in the vicinity, watch the behaviour of the gall wasps as they issue in the open, using those in the cage to indicate the time when observations can be made to the best advantage. Naturalists with nearby scrub oaks have an almost ideal outdoor laboratory for such work.

There appear to be more special adaptations among gall making insects than are found in most other groups, though it should be remembered that the gall makers are by no means a natural group, since representatives of several dissimilar orders of insects have acquired this habit. The alternation of generations in the gall wasps is closely paralleled by what is found in certain plant lice, except that with these we have an alternation of indeterminate series of generations, their extent being determined largely by seasonal conditions and the vitality of the food plant. Moreover, in this group, the alternate series of generations are very likely to develop upon such dissimilar plants as birch and witch hazel. Certain species of gall midges have a very similar development except that there is an indeterminate series of generations remarkable in that maggots continue to produce maggots (that is pupæ and adults are eliminated) and then eventually a generation continues its development to the perfect flies and these latter behave as other insects. The reason for this remarkable deviation from the normal appears to be due to the fact that these maggots subsist upon decaying wood and develop in places where neither flies nor parasites can penetrate readily, consequently a series of maggot generations gives an advantage which would not obtain if the insects were compelled to transform to flies and emerge in the open from generation to generation.

Insect galls, as intimated above, are simply abnormal developments of plant tissues. A little study of these deformities reveals surprising modifications. There is the comparatively simple swelling of catkin, leaf, leaf stalk, twig or root containing



DIFFERENT TYPES OF GALLS: A. Linden mite gall, sometimes very abundant on basswood leaves, note the varied forms. The interior is inhabited by microscopic plant mites. B. Maple spot gall, a yellowish-red margined gall, very common on soft maple; at the centre there is an almost transparent maggot. C. Bud gall on the western rayless goldenrod, note the protecting brush of plant hairs shown in the enlarged section. D. Goldenrod ball gall, very common, each inhabited by a large stout yellowish-white maggot. E. Cypress flower gall, a peculiar whitish flower-shaped growth sometimes very abundant on the twigs. F. Cockscomb elm gall, a deformity produced by a plant louse and occasionally very abundant on small trees, the slit-like entrance on the under surface of the leaf is shown in the upper right-hand figure. G. Downy flower gall, sometimes very abundant on goldenrod. H. Witch hazel cone gall, a greenish or reddish gall, sometimes very abundant and produced by a plant louse.—(Author's illustrations, Scientific Monthly.)

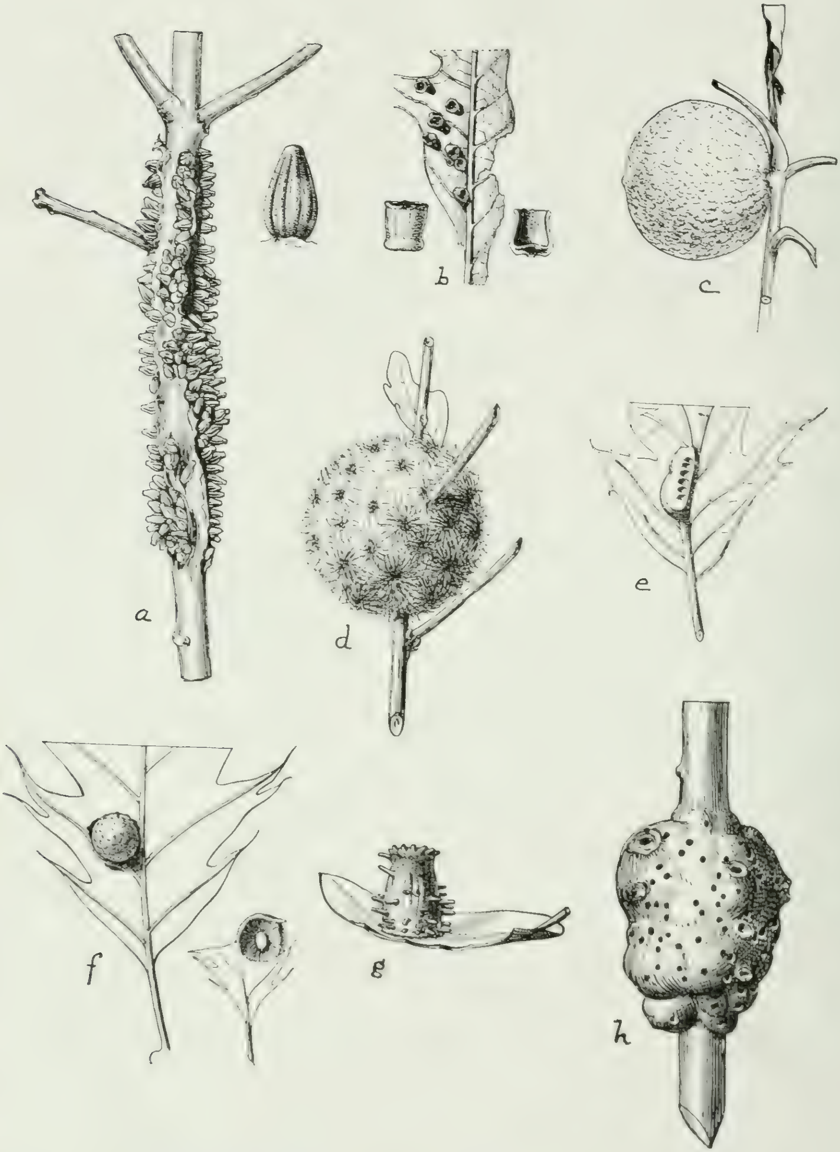
one or more maggots, each in a small oval cavity or cell. Many of these deformities have the surface clothed with wool-like hairs, really modified and greatly developed plant hairs. This is carried to an extreme in the spherical masses of delicate, creamy-white hairs with pink spots caused by the wool sower. This mass, beautiful because of its wonderfully delicate tints and deceptively heavy, is really nothing but many deformed buds, each cell containing a maggot and united to those around by the greatly developed plant hairs. Some of the leaf galls, aside from the distinctly wooly ones, present extremely interesting modifications in that the plant hairs are modified to form more or less well developed spines, as for example in the yellow sea urchin and some of its allies, with their peculiar ornamentations and often striking coloration. A few galls show this development to an even more striking degree and are variously and sometimes grotesquely angled or spined. There is an apparently uninteresting succulent oak gall which is very deceptive since it is hollow and most remarkable of all the cavity contains a free rolling oval cell in which the gall maker is securely ensconced. It is literally a "high roller".

Nature delights in camouflage or mimicry. The cypress flower gall is a striking instance of this tendency to simulate even in places where nothing of the kind would be expected. The pretty little gall with its delicate tints, suggests for all the world one of the smaller flowers, despite the fact that it occurs upon cypress, a tree which produces no such flowers as are found among the other plants. This deformity is produced by a little gall midge and occasionally is so very abundant as to fairly dot good sized limbs with its pleasing combination of colour and form.

The relation of the gall insect to the plant upon which it subsists is worthy of careful consideration. The gall insects are fragile, minute and in many cases with restricted powers of flight, some even being wingless. Nevertheless, hosts of species manage to exist in the face of these limitations and in some cases it is known that a colony may remain year after year for a considerable series of years upon one or two relatively isolated bushes. A very considerable proportion of these gall insects must attack some part of the plant when it is growing rapidly, and usually in early spring when the tender tissues are literally rolling out of the buds and are in a most plastic condition. It is very probable that a considerable series of globular or variously shaped galls on the surface of leaves originate when the foliage is still in the bud. The wide scattering of some of these growths is simply due to the expanding tissues after the young gall insect has established itself upon the developing leaf. But infestation is characteristic of a considerable series of gall midges, notably the peculiar forms producing variously shaped galls upon the surface of both hickory and oak leaves and as mentioned earlier, it is also true of a considerable series of the gall wasps. Were we to search carefully for an explanation of the peculiar alternation of generations mentioned above, we would probably decide that the appearance of this early spring, incomplete generation justified itself not only because all of the individuals were able to deposit eggs, but also on account of the fact that these eggs were deposited in the buds and therefore the young could develop under the best possible condition, due to the soft, plastic state of the leaves and catkins. In other words, alternation of generations is a modification which has enabled gall wasps to maintain themselves in large numbers, and an additional reason for believing this is seen in the fact that species presenting this marked deviation from what we usually find among gall insects are extremely abundant. It is one of the most striking of the numerous interrelationships occurring between insects and plants.

The mysterious and enchanting adaptations of gall insects are by no means completed with the above recital. Some of our plant lice exhibit equally interesting relationships. The galls of these insects are invariably recognized by the more or less distinct orifice and then there is usually a considerable cavity inhabited sometimes by one insect, frequently by more and occasionally the aphids are so numerous as to completely cover the entire interior so that a gall, when opened at this time, presents a striking resemblance in miniature to the geode. How is this strange modification brought about? Those who have studied louse galls state that in some cases at least, the parent insect simply establishes herself upon the leaf stalk, commences feeding and as a result of continued irritation, the plant appears to be compelled to develop an abnormal mass of cells which literally grows up and encloses its enemy. There is, of course, with this development of the plant, an increase in the number of the insects, so that eventually, conditions are as described above. Some of the jumping plant lice, rather closely related to the aphids just mentioned, are nearly as dependent upon hackberry as certain gall midges and gall wasps are upon oaks, and we find among these jumping plant lice not only a series of species upon a favored food plant but also an equally large series of galls, each with its peculiar structure, at least within certain limits.

These are not the only interesting relationships between insect galls and gall insects. There are also a number of species which take advantage of



CHARACTERISTIC OAK GALLS: A. Bud-like galls on oak twigs, sometimes very abundant and since they produce a sweetish fluid, hosts of bees, flies and other insects may be attracted in early summer. B. Oak spangles, produced by a gall midge, note the cup-like shape and the little oval cavity at the base, shown in the illustration of a sectioned gall. C. Large oak apple, one of the more common and striking galls produced by gall wasps. D. Gall of the wool sower, a delicate appearing white, pink-marked wooly growth containing seed-like cells, each inhabited by a white maggot. E. Mid-rib tumor gall sectioned to show the series of cells inhabited by the white maggots. F. Small oak apple, the one in section shows the characteristic central cell inhabited by a maggot and supported by numerous radiating fibres. G. A peculiar cylindrical-spined, rosy red, yellow-banded gall on a western oak. H. Gouty oak gall, a large swelling frequently forming bead-like enlargements on most of the smaller branches of various oaks, large trees sometimes being badly infested.—(Author's illustrations, Scientific Monthly.)

the activity and enterprise of gall insects and depend like the cuckoo among birds upon others to provide sutiable conditions for their young or even go farther and actually prey upon the true gall producers. The former is carried to a very high degree of perfection in the case of the gall wasps, since the gall "cuckoos", ,if we might coin a word, resemble the rightful owners of the gall so closely that it is very difficult to distinguish one from the other. Apparently the same thing exists, though to a more limited extent, among some of the gall midges and there are cases where it appears quite probable that a plant deformity of a given character may be produced by more than one gall midge, each performing its fair share of labour in the development of a common shelter. The enemies of the gall insects, generally termed parasites, are occasionally so numerous that comparatively few of the gall producers attain maturity. They are natural checks and when it comes to discussing the ethics of life, it is a little difficult to draw any satisfactory line between the gall insects, real parasites upon plants, the associates or cuckoo-like species which subsist at the expense of these plant parasites or the parasites of the gall insects, since they are all engaged in wresting life from other forms of life.

The above gives a little idea of the extraordinary interest attaching to insect galls and gall insects. There are in America, something like 1,400 different species and a considerable number await discovery in practically all parts of the country. Man has an innate love for nature and anything which will bring the individual into closer touch with the verities of life is a distinct gain for the human race. The hunting of animals, the study of birds, the collection of plants, are all manifestations of our love of nature. These are excellent recreations and comparatively well known. Insect galls and gall insects offer a large, accessible and relatively unknown field for the student of natural history, which can be entered to advantage by a very large proportion of amateur and professional naturalists.

BOOK NOTICES AND REVIEWS.

INTERESTING SEASONAL DATA.—In the Migrational Bulletin issued by E. H. Forbush, Ornithologist to the Commonwealth of Massachusetts, No. XI, dated Nov. 15, occurs the following:

"The autumn has been remarkable. Although there were many rains in September, most of the storms were warm and the season has been so mild and open that not only have fall flowers escaped the frost, but spring flowers and fruits have developed. Wild strawberries, raspberries and blackberries were ripening late in October. Many lawns, mowing fields and pastures still retain their green verdure. From the Berkshire hills to the Atlantic coast the trailing arbutus bloomed late in October, and the common dandelion blossomed again in many localities, besides the fall species, and in some cases it seeded for the second time this year. Both spring and fall dandelions were blooming the first week in November. Willow catkins are now (Nov. 15) open in eastern Massachusetts, and a few flowers still bloom in some gardens.

The effect produced upon the birds by such spring-like weather was what might have been expected. Not only did many of them sing in the usual subdued autumn tones, but some apparently gave their full spring songs. Even the flight songs of several species have been reported, and the singing of robins, song sparrows and some other species continued well into November. The mild weather seemed to delay the departure of some individuals of several species, and to bring about dilatory movements of the waterfowl."

Though the above writer may be mistaken in ascribing this late floral and fruiting activity to unseasonably mild weather, the facts of the case are interesting, especially the ornithological ones and it would be well for us to see just how widely these conditions and phenomena extended during the past autumn.

Late fall blooming of spring plants is not a very uncommon occurrence,[*] almost every season a few violets can be found here and there in the woods. Bloom on such plants occurs only immediately after awakening from a period of dormant quiescence such as is effected normally by the cold winter season, but a prolonged drought in summer will produce a similar effect and it can be artificially produced by florists by the use of narcotics, anesthetics or other more simple means of inducing unseasonable rest which will be followed by the production of bloom. Without doubt, the unusual amount of fall blossoming here reported was induced by a previous dry spell followed by wet that deceived the roots into the belief that a new spring had come. It will probably be found that in every such case it is the future that has been drawn upon, that next spring's flowers have been expended and the coming season will be one without floration and sterile for the misguided individuals that bloomed at the wrong time.

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[*] See Cephas Guillet, On Autumn-flowering of Various Wild Plants in 1900: Ottawa Naturalist, XV, August, 1901, pp. 123-126, in which a number of such cases are noted, though ascribed as above to unusually mild weather.

The singing of the birds is not to be explained by any such previous dry season though it may have been influenced by the unusual supply of spring food. It is now pretty well known that food has a considerable influence upon the seasonal activities of birds and under abnormal conditions enough sexually exciting food might have been produced to induce a limited effect in this direction.

That migrations should be disorganized by an unseasonable mild spell is to be expected. Some birds are greatly influenced by weather conditions, usually early spring and late fall migrants, whilst others coming and going long before actual need of migration is evident to us, migrate irrespective of early or late seasons and can be expected to appear and disappear with almost calendar-like regularity year after year.

P. A. T.

In THE CANADIAN BOY, Vol 1, Sept. 1918, p. 127, appears "The Naturalist's Nest," conducted by R. W. Tufts, Wolfville, N.S.

An albino robin is reported and described; then follows a discussion on the various eastern species of hawks in which the sheep are weeded from the goats in a manner that is satisfactory to the naturalist and interesting and instructive to the Boys (Scouts) in whose interest the periodical is published. The only point of criticism the reviewer feels like mentioning is evidently an accidental omission. It says of the Cooper's Hawk that it "is much like the Goshawk in appearance and general habits" without calling attention to the fact that the similarity of appearances only holds through the juvenility of the species, that in the adult plumage the two are as different in color as they are in size.

It is the firm opinion of the writer that the most practical method of educating the public in the economic and other value of birds, especially those against which there is a strong popular prejudice, is by appealing to the young and growing mind. It is most difficult to redirect established currents of thought, but the boy becomes a man within a few years and early impressions influence the whole after life. Such departments as this in juvenile literature are to be encouraged in every way. The history of great movements in modern times seems to indicate that it is only after several generations that fundamental changes in established thought and ideals can take place. The first generation view a radically new thought with suspicion, the second to whom it is not new endures and succeeding ones embrace it on its merits. Let us by all means get after the children at once.

P. A. T.

In the *Auk* for October, 1918, are several papers of interest to Canadian ornithologists.

NOTES ON NORTH AMERICAN BIRDS (pp. 463-467) is the title of a paper by H. C. Oberholser in which is discussed several subspecies of Canadian occurrence.

The Northwestern Belted Kingfisher, *Streptoceryle alcyon caurina* Grinnell (questioned by Taverner), is regarded as a valid race. The American Barn Owl is relegated to subspecific status with the European form, under the name *Tyto alba pratincola* (Bonaparte). Hellmayr's proposal to include the American Brown Creeper as a form of *Certhia brachydactyla* Brehm is rejected. The Alaska Myrtle Warbler, *Dendroica coronata hooveri* McGregor, is accepted as a recognizable subspecies. Brook's proposal of the Hoary Redpoll, *Acanthis hornemanni exilpes*, as a subspecies of the Common Redpoll, *A. linaria* instead of *A. hornemanni*, is rejected.

THE SUBSPECIES OF LARUS HYPERBOREUS Gunnerus by H. C. Oberholser (pp. 467-474). This paper investigates the hitherto rejected Point Barrow Gull, *Larus barrovianus* Ridgway, and decides that it is a recognizable race of the Glaucus Gull, *L. hyperboreus*, differing particularly in being smaller than the Atlantic form. He gives diagnosis, measurements and distribution, extending the latter as far east on the Arctic coast as Franklin Bay.

In the department of Recent Literature, W. S(tone) (pp. 486-489) reviews Dr. Dwight's Review of the Juncos at considerable length. Further on under Correspondence, Jos. Grinnell (pp. 505-507) has more to say on the same subject and it may be well here to mention that the paper is also reviewed in the *Condor*, July, 1918 (pp. 142-143), by H. S. Swarth. Further remarks occur on the same paper elsewhere in these pages.

Soper's Birds of Edmonton, OTTAWA NATURALIST, February and March, 1918, is mentioned in review (p. 489).

The Possible Avian Distribution of Hog Colera, Journ. Agr. Research, Vol. 13, 1918 (pp. 125-129), is summarized (pp. 495-496) and the resulting conclusion cited that pigeons and other birds of similar habits are probably never concerned in the spread of the disease.

In the department of General Notes, Cause of "Fishy" Flavour of the Flesh of Wild Ducks", W. L. McAtee (pp. 474-476). The decision is reached that the "fishy" flavour should probably be ascribed to the physiological condition of individuals rather than to the use of fish as food and it is asserted that many noted fish-eating species may be unexpectedly palatable.

FLIGHT OF HORNED OWLS IN CANADA by J. Dewy Soper, Preston, Ont. (pp. 478-479). In this the author observes that whilst the above species were unusually abundant in October and November, 1917, at various points in southern Ontario, they were abnormally scarce in the country north-east of Lake Superior where they are usually common.

P. A. T.

THE GEOGRAPHIC DISTRIBUTION OF COLOR AND OTHER VALUABLE CHARACTERS IN THE GENUS JUNCO; a new aspect of Specific and Subspecific Values. By Jonathan Dwight, M.D. Bull., Amer. Mus. Nat. Hist. Vol. XXXVIII, pp. 269-309, June, 1918.

Whether one does or does not agree on every point with the author of this paper, it must be regarded as an important contribution not only to the difficult subject of the genus to which it refers, but to zoology in general and ornithology in particular. In it Dr. Dwight offers a new solution to the confusion of differentiated forms of this highly variable group, and attempts to point out a way in which like problems can be simplified in other departments of zoology.

He cuts the gordian knot of the multitude of intergrading subspecies by raising several of them to full specific rank and regarding the intermediates as hybrid. As criteria between specific and subspecific variations he divides them into qualitative and quantitative characters; qualitative characters being new qualities, or characters, and hence specific in value and quantitative being an increase or reduction of quantity in qualities or characters already existing in the parent form and hence of subspecific value only. This is to replace the older hypothesis that species are wholly isolated units and that intergradation between extreme variations are proof of this subspecific relationship. It must be acknowledged that this is largely according to the trend of modern thought which is coming to regard the specific unit of systematists with growing distrust and as an unstable division. Whilst this view from a paleontological standpoint is unassailable the writer cannot but regard it as being misplaced in considering modern zoological problems. Through geological time species are uncertain if not fluid quantities flowing imperceptibly one into the other, but at any one given moment of time through any given geological horizon I cannot see how we can refuse to recognize their individual isolation from contemporary forms, without making confusion worse confounded and destroying our perspective of current events. The fact that species may be extremely variable within themselves and on the point of giving rise to new ones is not sufficient ground for rejecting the specific concept altogether. Whether or no we can frame a satisfactory definition for the species does not alter the specific fact, it merely indicates upon the limitations of our present knowledge. The fact that hybrids (as usually understood) between acknowledged species are usually rare, but constantly occur without swamping or mongrelizing the species seems evidence that the unit is a real one and not a figment of the imagination.

Dr. Dwight's distinction between quantitative and qualitative quantities seem subject to the question, which is which? He regards the black head and the red back of *J. oregonus* as qualitative, yet the gray head of *hiemalis* is but a reduced blackness, and the red back of *oregonus* but the persistence and increase of a color present in juveniles of the opposite race. It does not seem that these characters offer any better or perhaps as good a means of specific determination as those heretofore applied.

The characters of Dr. Dwight's hybrids also seem to lack the appearance logically to be expected in such individuals. True hybrids between specifically distinct forms usually show pie-bald mixtures of parental characters seldom even blendings of them. Our finest example of this arises from the crossing of the Red and the Yellow-shafted Flickers. These species hybridize most freely and the resultant shows if not in the first generation at least in the succeeding ones, a bewildering array of mixed pure characters in every possible combination, rarely a blending of them. Thus the moustache mark may be black or red or red and black, but rarely if ever, brown, which would be halfway between and a blending of the two. Dr. Dwight's hybrids on the contrary are all perfectly even blendings, one form imperceptibly gliding into the other, with very little reversion to pure parental characters. The very constancy of each type also raises a certain amount of suspicion. In every character true hybrids should show dominant, recessive and mingled resultants in such varied combination that duplicate individuals are the exception, not the rule. Dr. Dwight's postulated hybrids, however, are as constant in type as they are in blending. On the whole, while we admire Dr. Dwight's serious purpose and the amount of concentration he has brought to bear upon the subject, it does not seem that his attempt to form new standards of specific relationship will be more acceptable than the old ones.

In untangling the relationships between these confusing forms, however, the author has rendered a great service. Whilst his explanation of the causes may not be entirely acceptable, the facts he has brought out have probably simplified the subject considerably and in the light of his painstaking researches we are in a much better position to elucidate the snarl. I have not the space in which to go into the details of his many valid conclusions, but must refer all who are interested in the genus *Junco* to the paper itself.

P. A. TAVERNER.

NOTES AND OBSERVATIONS.

RE SIGHT IDENTIFICATIONS.—The following is from the pen of that veteran ornithologist, Wm. Brewster, whose status as Dean of American ornithology is unchallenged. It appears in his Birds of the Cambridge Region, Memoirs of the Nuttall Ornithological Club, No. IV, Cambridge, Mass., 1906, Preface, pp. 5-6.

"My early training and experience have lead me to believe that with certain exceptions to be specified, the occurrence of birds in localities or regions lying outside their known habitats should not be regarded as definitely established until actual specimens have been taken and afterwards determined by competent authorities. No doubt it is becoming more and more difficult to live up to this rule because of the ever-increasing and, in the main, wholesome, popular feeling against the killing of birds for whatever purpose. Nevertheless I cannot admit that the mere observation of living birds met with in localities where they do not properly belong, or where they have not been ascertained to occasionally appear, should often be considered as establishing anything more than possible or probable instances of occurrence—according to the weight and character of the evidence."

"Exceptions to the rule may and indeed *should* be made in the cases of species which like the Turkey Vulture, the Swallow-tailed Kite, and the Cardinal, are easily recognized at a distance and which are reported by persons known to have had previous familiarity with the birds in life. Sight identifications of species somewhat less distinctly characterized than these just mentioned, if made under favourable conditions by observers of long field experience and tried reliability, may also sometimes be accepted with entire confidence. But on no authority, however good, should a mere field observation of any bird that is really difficult to identify, be taken as establishing an important primal record."

It may also be said that Dr. J. A. Allen, another of our old veterans of ornithology whose standing is beyond question, in reviewing the above work in the *Auk*, XXIII, 1906, p. 470, heartily endorses the above. After quoting the substance of the above, he remarks:

"This is the basis of the author's rulings in the present paper—a proper and the only safe basis in view of the present day method of numerous amateur observers, who are too often burdening ornithological literature with ill-advised records."

It may be added that the editorial policy of THE OTTAWA NATURALIST agrees heartily with these sentiments. We ourselves have many sight records which we are morally certain are correct but without specimens, except under the most exceptional circumstances, we do not feel justified in publishing them as more than hypothetical and then only with as many details in substantiation as possible that the reader may judge for himself of their sufficiency.

P. A. TAVERNER.

ORIGIN OF PLACE NAMES IN OTTAWA VALLEY.—I was much interested in the note by Mr. Douglas in THE OTTAWA NATURALIST for November, 1918, regarding the origin of the name Gatineau as applied to Gatineau River. While a very reasonable conclusion as far as it goes, there still seems to me some reason to doubt the connection between cause and effect in this case, owing to the vagueness of the proof that Monsieur Gatineau ever reached the river said to be named after him.

This doubt of mine is strengthened by the fact that I was given a very different derivation of the name by the late Mr. Lindsay Russell, who was for many years Surveyor General for Canada. He had an intimate knowledge of all the Ottawa tributaries, particularly the Gatineau and their peoples and to my personal knowledge a very considerable familiarity with their language.

He told me that the name Gatineau was Indian, that it was derived from the Cree word Etinos, meaning "The People"; *i.e.*, the people of any particular district, and means "the river of the people", who lived in its territory. Might not this to some extent account for the Wright's spelling it Gatineau.

He also told me that one of the large tributaries marked on the map as Jean de Terre was wrongly so marked, as the original name was "Les Gens de la Terre" and was a literal translation of the name of the main river.

As to the G. sound beginning the name, anyone who is interested in Indian languages knows how prone they are to throw around their consonants loosely, as witness Mitchi, Kitchi, Gitchi, each meaning great, or grand, and Nippi, Tibbi, and Sibbi, a body of water, and all in use in the same district. This was probably due to the language not being a written one.

ARMON BURWASH, ARNPRIOR, ONT.

NOTE ON TURTLES.—I venture to point out some innaccuracies that have crept into Mr. Thompson Seton's comments on Turtles in the November number of THE OTTAWA NATURALIST.

The eggs of the Eastern Painted Turtle can scarcely be described as "nearly round"; they are decidedly elongate in shape. The number to a nest in this district is from eight to ten. I have no exact data on the incubation period of the Painted Turtle, but have reason to believe that—in the Ottawa Valley at least—it is much longer than two weeks. In the statement Mr. Thompson Seton quotes from Agassiz: "The Painted Turtle has an almost identical period of incubation with the Snapping Turtle, namely, from the 11th to the 25th June", the word "incubation" is evidently a mistake for "oviposition". Both turtles lay about the middle of June, but the young of the Snapping Turtle certainly do not emerge from the shell until September or October; and even then, as far as my experience goes, they remain buried in the sand until the following spring.

Again, the egg of the Snapping Turtle is not "less round" than that of the Painted Turtle, for it is perfectly spherical. And the number of eggs to a nest may often be as many as fifty. Five nests of which I have record contained respectively 39, 45, 49, 50 and 51 eggs. Half a dozen other nests not so carefully counted contained manifestly similar numbers. I have never seen a nest with as few as two dozen eggs in it.

C. MACNAMARA, ARNPRIOR, ONT.

ADDITIONAL NOTES ON MANITOBA TURTLES, SNAKES AND BATRACHIANS.—Mr. Thompson Seton has provided us with a very useful contribution in the November number of THE OTTAWA NATURALIST which every Manitoban interested in wild life will appreciate. A residence of more than thirty years in the province enables me to add a few facts which are presented below.

The Western Hog-nosed Snake, *Heterodon nasicus* B. and G. It is rather surprising that this interesting snake has not been recorded. It was taken by my father, Percy Criddle, in about 1884, and has since been observed on many occasions at Aweme and surrounding places. A very fine example was presented to me, as a rare insect, in a net, some years ago by that friend of every young naturalist, the late Dr. James Fletcher, who in company with Mr. J. B. Wallis captured it in the sand hills near Onah. This snake's habit of shamming death is well known. Among those unacquainted with its harmlessness it is credited with being a "puff adder" giving forth a deadly vapour from its mouth, this being supposedly demonstrated by the habit the snake has of flattening itself out while hissing. There are probably few reptiles that can show a bolder face and yet are so little able to put their threats into practice.

The Garter Snake is one of those that protects its young by taking them into its mouth. Naturalists used to be sceptical as to this acclaimed habit, which is a fact nevertheless. The practice has been witnessed more than once by us in Manitoba.

In addition to the Hog-nosed Snake we have at least one Swift, *Sceloparus* sp? which inhabits wet or low lands.

The Mud-Puppy, *Necturus maculosus*, occurs in all the rivers of southern Manitoba, being probably much commoner than is generally supposed, as the examples taken are usually secured on a fish-hook.

The distribution of the Snapping Turtle, *C. serpentina*, is also of considerable extent along rivers and I have seen examples as far west as eastern Saskatchewan in the Souris river.

On July 10, 1918, I came across a large example of the Painted Turtle, *C. marginata bellii*, which had crawled over a wide extent of sand in search of a "nesting" site. It was at rest on some ground juniper, *J. procumbens*, when secured but no indications of a "nest" were visible. The turtle was fully a mile away from the nearest water, the Rice lake, Onah, and had been obliged to climb various steep hills in her journey towards the sand.

NORMAN CRIDDLE.

RAILWAYS IN THE OTTAWA VALLEY.—Respecting Mr. Keele's articles on the "Location of Towns and Villages in the Ottawa Valley", printed in THE OTTAWA NATURALIST, November, 1918, Mr. James White, of the Commission of Conservation, points out that: The first railway line into the Ottawa valley was the Prescott and Ottawa,, or, to use the original name, the Prescott and Bytown railway. This line was opened for traffic December, 1854. The Brockville and Ottawa, later, the Canada Central, was opened from Brockville to Almonte in August, 1859, and the branch from Smith's Falls to Perth was completed in February of the same year. The extension from Almonte to Sand Point was completed prior to 1867.

Later, a line was constructed from Carleton Place eastward to Ottawa, and the line to Almonte was extended northward to Pembroke via Pakenham, Arnprior and Renfrew.

The Canadian Pacific purchased the Canada Central in 1881, and included the portion of this line from Ottawa to Pembroke in its transcontinental line, thereafter operating the portion between Carleton Place and Brockville as the Brockville branch.

A MANITOBA LIZARD.—I have been very much interested in Seton's List of Turtles, Snakes and Batrachians of Manitoba. The following may be of interest:

On June 15, 1918, Mr. McIntosh, from the staff of the city schools here, and I made a trip to the big larch swamp about 15 miles east of Brandon. In order to prevent fire running we chose a site in a gravel pit in which to build our fire for dinner and I threw my coat on the hot sand while we were preparing the meal. When I came to look at it there was an undoubted lizard basking in the sun on top of the coat. It would be, I should say, about seven inches long, striped and somewhat bronze in color, rather darker than I have usually seen in what I took to be the same species in the East. I suppose it was *Sceloporus undulatus*, or what in Ontario we called the Swift. I wanted to secure it but we thought we would take a description first and while Mr. McIntosh was looking for his book it darted into the folds of the coat and the most diligent search failed to locate it.

B. J. HALES, BRANDON, MAN.

ON THE CHUB MACKEREL *(Scomber japonicus)*. A specimen of this species of fish was lately received from the Canadian Fishing Company, Vancouver, B.C., by the Fisheries Branch of the Department of Naval Service, for examination; and the undergiven are a few of the features of the specimen:

The colour is black on the top of the back blending into bluish over which are a series of blackish streaks, which extend little below the lateral line, leaving the sides and all the under part of the fish silvery—the first dorsal fin is about as high as long, and has seven spines preceded by two isolated spines (although the species is described as possessing in all a first dorsal with nine spines)—the second dorsal fin is composed of rays, apparently preceded by a spine, but the character of this fin has become obscured, and the fin is followed by some five finlets—the anal fin is preceded by an isolated very small spine and composed of rays, apparently preceded by a spine, but as in the second dorsal the character in the specimen is obscured; and the anal fin is followed, as in the case of the second dorsal, with some five finlets—the maxillary bone reaches to the front of the pupil of the eye; the jaws are beset with very minute teeth. The specimen is a male, fourteen inches in length.

The following is the geographical distribution of the Chub Mackerel (which has a much wider range than the Common Mackerel of the Atlantic) as given in my *Check List of the Fishes of Canada:*

Widely distributed in the Atlantic and Pacific oceans; extending as far northward as British Columbia, Labrador, and England; abounds off the coast of California, in the Mediterranean, and everywhere in Japan.

ANDREW HALKETT.

CHERT USED BY THE INDIANS AS MATERIAL FOR ARROW HEADS, ETC., FOUND IN THE OTTAWA VALLEY.—In Mr. Keele's article on "The Location of Towns and Villages in the Ottawa Valley", in the October number of this journal (p. 69), he says the "flint" used for the manufacture of arrow points, etc., found in the Ottawa valley, probably "came either from Welland county on Lake Erie or from Flint Ridge, Ohio." Chert, commonly called flint, of which most of the arrow heads, spear heads and other chipped artifacts were made by the Indians in Ontario, is known to occur in the local Black river, and Chazy formations, and it seems reasonable to suppose that the Indians would use local supplies instead of bringing chert from such a distance. Until a few months ago, however, the only known place in the Ottawa valley, where chert had probably been quarried by the Indians, was at the Narrow locks, dividing the upper and lower Rideau lakes. Here Dr. Beeman, of Perth, found "what was evidently an open-air workshop, as the shore for yards was covered with flint chippings," and the chert "could be obtained on an island but a short distance from this point."* Last fall I found a handful of scattered chert chippings imbedded in the footpath along the north bank of the Rideau river, west of the Canadian Pacific railway bridge (Prescott division). I also saw a large nodule and some seams of chert, of the same colour as the chippings, *in situ* in the outcrop of limestone at the head of the rapids on the opposite bank. I picked up a few chips of the same material on the south bank east of the bridge. Now, the presence of these chippings and the chert *in situ*, so close together, leads me to believe that the material found here was quarried by the Indians, but, the operations were probably by no means as extensive as those at the well-known quarry near Point Abino, in Welland county, Ontario.

W. J. WINTEMBERG, OTTAWA.

The December, 1919, issue of The Ottawa Naturalist was mailed on Feb. 3, 1919.

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*Beeman, Dr. T. W., "Lanark County," Annual Archaeological Report and Canadian Institute (Session 1891), Toronto, 1892, p. 15.

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THE BIRDS OF SHOAL LAKE, MANITOBA.*

By P. A. Taverner.

Shoal Lake, Manitoba, lies some thirty-five miles a little east of north from the city of Winnipeg and approximately midway between the lower lobes of the two great lakes, Winnipeg and Manitoba. Though brought to the attention of ornithologists at an early date and later repeatedly visited by collectors, very little information has found its way into print regarding the details of its bird life.

Donald Gunn visited the lake in 1867, and his account[1] is extensively quoted by Ernest E. T. Seton (Ernest E. Thompson or Ernest Seton Thompson) in his Birds of Western Manitoba.[2] The same notes with additions appear in The Birds of Manitoba[3] by the same author and briefly summarized again in the bird part of his Fauna of Manitoba[4] in which the nomenclature is brought up to date.

In 1891, Fred Dippie was in the adjoining locality of Raeburn. In 1893 and the following year Edward Arnold[5] and Walter Raine visited the lake itself. The latter casually mentions Shoal Lake in his Birds Nesting in Canada[6] but gives no details, and his only published account appears in the Oologist.[7] Frank Chapman and E. T. Seton were on the lake in July, 1901. The former has a popular generalized account of his trip in his Camps and Cruises of an Ornithologist,[8] and I am indebted to Mr. Seton for a copy of his original field notes which I have quoted freely in the following. By him I am informed that Mr. Miller Christy, of Broomfield, Essex, England, visited the vicinity in May, 1887, and a collection of birds he made there is now in Seton's museum. June 27 to 29, 1912, Mr. Herbert K. Job and his son visited the south and west end of the lake looking for headquarters at which to obtain water bird's eggs for propagating purposes, but found the locality unsuited to their work. Mr. Job has kindly furnished me with a copy of his notes. I have heard of several other observers having collected about the lake at various times, but reports from them are not available at the present writing. From the context most of these trips have been made to the southern extremity of the lake, or in the case of Gunn, 1867, along the west side as far north as the Narrows.

Prompted by these accounts—and desiring a representative collection of Manitoban material, the Biological Division of the Geological Survey, Canada, made an expedition to Shoal Lake the spring of 1917. The party consisted of Mr. C. H. Young and the writer. We arrived at the C.N.R. station at Erinview, some four miles from the east side and about opposite the middle of the lower section of the lake, on May 16. Here we were fortunate in meeting Mr. Frank Ward, who with his father and brother, lives on the lake shore. He transported us and our baggage to his farmstead and allowed us camping privileges in the immediate vicinity. The Ward brothers proved to be unusually well informed sportsmen naturalists and we are indebted to them for many interesting notes and much valuable assistance during the course of our work. I heartily recommend them to all visiting naturalists.

On the map, Shoal Lake is indicated as being about thirty miles long north and south and ten miles in extreme width at the southern end. It is very irregularly shaped, with a constriction called the Narrows somewhat below the middle, forming practically two lakes divided by wide marshes through which winds a narrow creek-like channel. Both Chapman and Gunn describe the shores as composed of broad marshes with tall reeds in which water birds, grebes, ducks, and rails nested in immense numbers, and with stony islets in the lake populated by nesting gulls, tern, pelicans, and cormorants. Today this description and outline are hardly recognizable. The water has fallen from eight to ten feet from its old level, as indicated by the old shore line still visible and the outline and conditions are greatly changed. The Narrows are now high, dry hay fields and the creek channel is a dry ditch winding its way across two miles of open prairie cutting the lake into two separate bodies of water having no communication with one another. The surrounding marshes have disappeared and in their place are broad reaches white with alkali crystals. The islets, deserted by their original tenants, are of considerable extent and with long sand and stone shoals reaching toward each other or toward the shore. Of the luxuriant growth of reeds nothing remains but the root tops in the mud, prevented probably by increasing salinity from following the water in its retreat from the old shore-line. Of the vast numbers of birds that once treaded the mazes of the marsh practically none remain but the few that are restricted to the borders of the rapidly disappearing pools back from the shores.

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[1] Notes on an Egging Expedition to Shoal Lake, west of Lake Winnipeg, Manitoba. Twenty-second Annual Report, Smithsonian Institution, for 1867, pp. 427-432, by Donald Gunn.

[2] Birds of Western Manitoba, by Ernest E. T. Seton, Auk III, 1886, pp. 143-156 and 320-329.

[3] The Birds of Manitoba, by Ernest E. Thompson, Proc. U.S. Nat'nl. Museum, XIII, 1891, pp. 457-653.

[4] Fauna of Manitoba, by Ernest Thompson Seton, as it appeared in British Association Handbook, Winnipeg, 1909 (repaged?) pp. 3-47, part on birds, pp. 11-47.

[5] A Few Notes from Shoal Lake, Manitoba, Oologist, XII, 1895, pp. 22-24, by Edward Arnold.

[6] Birds Nesting in Northwest Canada, by Walter Raine, 1892.

[7] A Rough Time Collecting at Shoal Lake, Manitoba, Oologist, XII, 1895, pp. 3-6, one plate, by Walter Raine.

[8] Camps and Cruises of An Ornithologist, by Frank Chapman, Appleton Co., New York, 1908.

A tradition from aboriginal sources asserts that the lake rises and falls regularly with a period of about fifteen years. Mr. Seton informs me that "the waters of Shoal Lake, in common with all in Manitoba, have a fashion of rising and falling in periods of about seven years". However regular this rise and fall may be and what the period is, Shoal Lake was high in 1867 when visited by Gunn, also in 1901 when Chapman and Seton were there. The Wards arrived on its shores about 1889 and Ward, Sr., declared that at that time the lake was low. It is evident from the reports of Arnold and Raine that the water was fairly high in 1894 and the Wards say that it reached its maximum about 1899. It rises faster than it falls we are told. Whether the water will ever come back again to its old level remains for the future to show. Should it do so it will offer a remarkable interesting ecological study in investigating the effects of the change from highly alkaline to practically fresh water upon the contained and surrounding life. Before this change takes place it is most desirable that a comprehensive study should be made of the present biological conditions as a basis of contrast with higher stages of water.

The lake has no important inlet and no outlet. The level is probably governed by the variation in annual rainfall extending over a series of years. The geological strata in which the lake lies is obviously porous and fissured with underground channels, as evidenced by changes in the water of near-by wells, but I have heard nothing of corresponding variations in level of the great lakes on either hand, so the local conditions are probably independent of them.

The surrounding country is prairie, liberally sprinkled with small clumps of bush. These clumps, called "bluffs" throughout the prairie provinces, range from mere spots of one or two low growing bushes to several acres of woodland and are occasionally a mile or more in their longest direction. They are usually very dense and sometimes all but impassable owing to underbrush, felled tops, or burnt trunks criss-crossed on the ground like jack straws. The edges, however, are sharply defined and between them runs the clear prairie, winding in and out, narrowing here to grassy lanes and widening there to green glades or broad meadows of varying extent. All the woodland has suffered severely from fire. Grazing is the principal industry and the practice of burning the dead grass to induce a vigorous growth has not only tended to check the natural spread of the bluffs but has devastated many of them and groups of black skeleton trunks offend the eye more often than is desirable.

Most of the timber composing the bluffs is poplar with willow and other smaller shrubbery about the edges. In the largest bit of woodland in the neighbourhood of our camp is a small stand of burr-oak and on Maple Island, some five miles up the lake—an island no longer—is a little maple (Sp.?) from which sugar used to be made. At the head of the upper lake, we are informed, considerable spruce or evergreen exists, but there is none in the parts visited by us. Poplar is the principal timber and that upon which the residents rely for general uses and for fuel. Viewed by eyes accustomed to eastern woodlands none of the growth is large—a ten-inch trunk is the maximum now seen, though occasional rotting stumps indicate that larger trees were more common before they fell to the axe of the early settlers. Now most of the growth is little more than pole size and rarely exceeds a height of 40 feet.

Here and there, where the level of the land is lower, there have been marshes and the so-called red-root bogs are common and muskeg occurs locally. Now, however, owing to the lowering of the water-line these are mostly dry except in spring and represented by damp areas with a few reed-like water grasses growing about the occasional watery spots which still persist. On my return in September I found that most of these hydrophytic evidences were obliterated and the usual hay grass was growing where in the spring cat tails and reeds had flourished. Occasional ponds had remained through the summer's drought, but few of these promised to last long.

The spring of 1917 was late and as we passed over the prairie on our arrival our driver pointed to the grass just appearing through the dead mat of last season's growth and remarked that it should be from 8 to 10 inches high. The poplars were just coming into leaf and the few oaks in the big woods behind the camp were still bare and gaunt. Though the day of our arrival was oppressively hot a change came before we had pitched camp and thereafter we had raw, cold weather during most of our stay, with ice forming in the pails of water at night and towards the middle of June we were glad to have our stove in the working tent even throughout the warmth of the day.

The lake is subject to sudden cyclonic squalls and high winds. The former burst suddenly out of clear skies, whirl a cloud of dust and debris high in the air, and subside as quickly as they rise. On one occasion we saw where a boulder of considerable size had been rolled over and over on the mud shores by a particularly vicious twister. The squalls do not last long but they try tent material and pegs. The steadier wind storms are violent and sustained and during our stay several of them tested the texture of our canvas and raised anxiety for our specimens and effects. I would advise all future campers to select sheltered spots for their quarters.

The shores of Shoal lake in 1917-18: view near camp.
The shores were of this character everywhere.

In the fall the writer spent from September 17 to 26 in the same neighbourhood to obtain an idea of the autumnal conditions and to fill some of the gaps of the spring work. It was after the first frosts and while the days were warm and pleasant, the nights verged on freezing.

We were disappointed in not finding any great breeding ground for water birds; a few ducks still remained in spite of the altered conditions of the lake, but evidently are becoming fewer each year. Waders still visited the shores, and birds were fairly numerous. We had no difficulty in obtaining as many specimens as we were able to prepare. Unfortunately in shipping our collections to the Museum one box, containing the majority of our small birds, was lost in transit. Manitoba is the most eastern of the prairie provinces and one of the most important subjects of geographical distribution in Canada is the location of the meeting points of prairie forms with those of the eastern woodlands. As the determination of these fine subspecific points must be based directly upon specimens the loss of them was serious and it was largely to replace them that Mr. Young returned to Shoal Lake the spring of 1918, spending from April 23 to October 2 on the same grounds we had occupied the previous spring.

He arrived just after the ice had broken up on the lake and the ducks and geese, after being confined to the narrow strip of open water between the shore and the main ice field, had repaired to mid-lake where they could be occasionally seen and even recognized but seldom collected. He found the land slightly if any wetter than it had been the previous fall, and where we had waded thigh-deep in the spring was dry and growing hay. April and May were very dry, the restriction of marshy areas increased apace and heavy rains in July failed to replenish them even temporarily. Consequently, the ducks and water birds that remained in 1917 deserted the vicinity and very few bred in 1918.

Mr. Young worked all the adjoining country in the neighbourhood of the Ward homestead as far as it was possible on foot and made several auto trips farther afield. The day before he left he reported a heavy frost. In the course of this season's work he obtained personal notes on 183 species, and specimens of 147 of them, which added to the previous year's observations and collections, form a sufficient basis for a fairly complete and representative list of the birds of the locality.

Some few species are herein included upon circumstantial evidence and until confirmatory specimens are secured must be looked upon as hypothetical. However, the evidence upon which they are based is fully given and the reader can form his own judgment as to their value, bearing in mind, however, that no record is absolutely unassailable until specimens are secured and examined by competent authority.

1. WESTERN GREBE, *Aechmophorus occidentalis*.

Though reported by all previous observers as remarkably common we saw none at any visit. The Ward brothers say that they used to breed in such numbers on the marshes that a canoe could scarcely pass between their nests, and Seton reports the species as an abundant breeder and notes that "its shrill metallic cries could be heard from the quill reeds day and night". He further observes "it is the easternmost breeding place of the species. Most birds peter out towards the limit; but here, at the northeastern corner of its limit, this bird has a sort of metropolis". With the lowering of the water this is all past.

2. HOLBOELL'S GREBE, *Colymbus holboelli*.

Reported by Gunn "in fair numbers" and by the Ward brothers as "never very common". Two seen by Young, May 25, 1918, are all we can report.

3. *HORNED GREBE, *Colymbus auritus*.

Both Arnold and Raine report it nesting in 1894. One only was noted in 1917, on June 4. In 1918, Young found it rather common, noting it almost daily through May and from the end of July to Sept. 2.

4. *PIED-BILLED GREBE, *Podilymbus podiceps*.

Seton reports it common and evidently breeding. In 1917, we noted but three in September on a small pond, but in 1918 Young observed individuals, mostly singles, April 25 to May 18, and the latter half of August to the middle of September.

5. *COMMON LOON, *Gavia immer*.

The Ward brothers say that it used to breed though they never found its nest. On both visits we saw single individuals almost daily. They were usually observed flying over and seldom showed any inclination to stop on the lake.

6. IVORY GULL, *Pagophila alba*.

In Mr. Darby's taxidermy establishment in Winnipeg, I examined on May 15, 1917, a mounted specimen of this species which I was informed was taken at Woodlands, Man., on Dec. 27, 1915, a station on the Canadian Northern Railway just south of Shoal Lake, and hence within the scope of this paper. It is a medium-sized, pure white gull, with face and forehead flecked unevenly with light smoky gray, with remains of terminal tail band, dark spots on tips of primaries, and a few dark flecks on tertiaries, bend of wing, and lesser coverts.

7. HERRING GULL, *Larus argentatus*.

Chapman reports finding a few Herring or California Gulls nesting on Pelican Island and states that they were very troublesome to other birds, destroying numbers of Tern's eggs and even those of the Pelican. Large gulls of the Herring Gull type were seen by us on every visit but were very shy and all we managed to take were Ring-bills. Young tells of a Herring Gull carrying off a Horned Grebe he had shot and was wading out to retrieve, lifting it bodily by the nape of the neck and taking it out to mid-lake where, joined by another, the two proceeded to tear it to pieces. The Ward brothers say the species bred on one of the rocky islands as late as 1916, but as no boats were available were unable to say whether they continue to do so or not.

The specific status of the larger gulls of the province has not been well determined. Specimens of both migrants and breeders are necessary from various localities. The Herring Gull and the California Gull, *Larus californicus*, are so similar as to be differentiated with difficulty. When juvenile, probably careful size camparison between similar ages and sexes is the only guide. When adult, probably the best criteria is the colour of the legs and feet; in *argentatus* these are flesh coloured whilst in *californicus* they are said to be light greenish.

8. *RING-BILLED GULL, *Larus delawarensis*.

Raine reported the species breeding on the islands in 1894. We saw a few in the spring of 1917, but were not always able to separate them with certainty from the Herring Gull as the ringed bills are only safe criteria when perfectly adult and most of the large gulls seen on the lake showed various traces of juvenility. Young recognized the species with certainty only during the latter part of July, August, and September. Four birds were taken and all are juveniles. They probably do not now nest on the lake.

9. *FRANKLIN'S GULL, *Larus franklini*.

In 1917, common on our first arrival May 17, but became scarcer towards the latter part of our stay, to June 14. According to Young, it was present on his arrival on the lake on April 24, reached a maximum on May 7, and then gradually became reduced in numbers to June 7. It returned on July 1 and remained until Aug. 27, after which no more were seen. Very large flocks were noted Aug. 8 to 10. Chapman notes it as breeding, but there is no indication that it nests on the lake now that the marshes are gone.

10. *BONAPARTE'S GULL, *Larus philadelphia*

Not identified by us in 1917 though a flock of birds noted at a distance, Sept. 22, were probably of this species, as Franklin's Gull seems to leave before this date. In 1918, Young saw eleven on May 25, taking specimens in verification. They appeared again in some numbers on Aug. 16 and remained without much diminution up to the date of his leaving, Oct. 2. Though Seton (*Auk*, 1886, p. 147) cites Gunn as the authority for its breeding on Shoal Lake and repeats the statement in subsequent lists, including his Fauna of Manitoba, British Association Handbook, 1909, I cannot but regard it as a mistake, and think that Franklin's Gull has been the basis of these records. The nearest well authenticated records of the breeding of this bird is on the lower Mackenzie. The more or less common occurrence of non-breeding Bonaparte's Gull in summer dates, as far east as the Atlantic coast, has probably been to blame for many confusions of breeding records between these similar birds.

11. CASPIAN TERN, *Sterna caspia.*

On the gravelly islands where the Common Tern used to nest in immense numbers the Ward brothers tell us that there were occasional sets of eggs that were so much larger than the rest as to attract immediate attention. The parents of these seemed to them to be exactly similar to the other tern flying about but considerably larger. Though they regarded them at the time as only monstrosities there can be but little question but that these were Caspian Tern. The numerical ratio these eggs bore to those of the Common Tern was about five to a thousand.

12. *FORSTER'S TERN, *Sterna forsteri.*

Seton says that while he did not note the species, Miller Christy found it common on May 1, 1887. Arnold and Raine report colonies of hundreds of nests, but it is suggestive that they make no mention of the Common Tern. In 1917, we found Forster's Tern in company with the Common Tern but generally scarce. In 1918, Young observed it from the 8th to the end of May, but much more common during the last week. He has one hypothetical record for two individuals, namely Aug. 21. The Wards say that it was once much more common than now and that it used to nest singly on the musk-rat houses in the marsh and not on the gravelly islets with the Common Tern.

13. *COMMON TERN, *Sterna hirundo.*

The Ward brothers tell us that when the water was high the Common Tern nested in immense numbers on the gravelly islets. On one such islet of about three acres, they once estimated one thousand nests. In some places the foot could not be put down without treading on eggs. This statement is largely confirmed by Seton. Such descriptions, however, do not represent the species at Shoal Lake now and there is no indication of any nesting there. The species was occasionally common during our spring visit in 1917. In 1918, Young found them more or less common during the latter half of May and noted a few individuals occasionally through June, July and August and as late as Sept. 16, when a flock of thirty was seen. The Common Tern can be separated from Forster's in life by the grayness of the white below. In Forster's Tern the under parts look a dazzling, pure white in the sun, a character that is obvious when both species are in view together and, after a little experience, of value when they are seen separately.

14. *BLACK TERN, *Hydrochelidon nigra.*

A common breeding species nesting in the few wet spots remaining back from the lake. None were seen in September of 1917. Young reports heavy migrations Aug. 1 to 21, and the last seen, Sept. 3.

15. DOUBLE-CRESTED CORMORANT, *Phalcrocorax auritus.*

Said by Gunn, Seton, and the Ward brothers to have been a common breeder on the islands, but now, except for occasional stragglers and during migrations, they have deserted the lake. None were seen by us in 1917, but Young reports flocks of five to sixty in late April and early May with straggling singles on May 23 and Aug. 29. All seen were flying over, mostly from east to west, towards Lake Manitoba. Probably the growing alkalinity of the lake has destroyed the fish and forced them to seek other feeding grounds.

16. WHITE PELICAN, *Pelecanus erythrorhynchus.*

Said by the Ward brothers to have been a very common breeder on the islands during high water, and Raine speaks of an "Island white with them" in 1894. Seton tells of seeing a flock of thirty-five and finding a score of deserted nests, "the eggs strewn about, in some cases evidently sucked, I suppose by Herring Gulls". We are told that their eggs used to be regularly gathered by Indians and others. In one case a boat-load were boiled and fed to the hens. At present only a few small flocks appear in the spring, and occasional summer visitors. Young reports thirty on May 6, which were all we saw.

17. *RED-BREASTED MERGANSER, *Mergus serrator*

Young found one dead on the beach near the Narrows in the spring of 1918. This is our only definite record of the species. Though the Ward brothers do not distinguish between the two big saw-bills, they report them common in spring but do not think they breed locally.

18. *HOODED MERGANSER, *Laphodytes cucullatus.*

Young reports this species in early May, the middle of June, late July and the last of August. The Wards state that it breeds in the neighbourhood and that young in flapper stage are often seen in small pools and standing in ditch water along the railroad tracks, and that it is one of the earliest of ducks to mature.

19. *MALLARD, *Anas platyrhynchos.*

One of the commonest ducks though being rapidly reduced as a breeder by the progressive restriction of suitable marshes.

20. *BLACK DUCK, *Anas rubripes.*

The Ward brothers seem to know this species and describe it as a rare fall migrant. We are in receipt of a specimen labelled Winnipeg, Man. (W. R. Hine) which we are informed by its donor, Mr. Seton, was taken at Shoal Lake. The date is not recorded.

21. *GADWELL, *Chaulelasmus streperus.*

Raine found nests in 1894 and Seton noted them on Pelican Island on July 6, 1901. Wards say it is, or was, an uncommon but regular breeder. Specimens were taken on May 15 and 19, 1917, and Young reports a few individuals during May, 1918.

22. BALDPATE, *Mareca americana.*

Raine found nests in 1894 and Chapman in 1901, and the Ward brothers say it is one of the scarcest of the ducks and growing more so. Young reports seeing individuals at the end of April and in the beginning of May, 1918.

23. *GREEN-WINGED TEAL, *Nettion carolinense.*

A common breeder and still lingering in some numbers, seeming to require less extensive marshes than many other species of duck.

24. *BLUE-WINGED TEAL, *Querquedula discors.*

A common breeder similar to the green-winged but seen considerably later in the fall.

25. CINNAMON TEAL, *Querquedula cyanoptera.*

Seton (*Auk*, 1886, p. 328) quotes R. H. Hunter as having taken a specimen at Oak Point, on the adjacent Lake Manitoba shore. This is near enough to the locality under discussion for mention though the lack of recent records for the species and apparent absence of specimens render it a little unsatisfactory.

26. SHOVELLER, *Spatula clypeata.*

A common breeder in 1917. Said by the Wards to be the only duck that is showing an increase, and they describe, during the past three years, vast flocks of a thousand or more in eclipse, remaining until the fall plumage is assumed when they depart for the south. However this may have been just previous to 1917, we have seen nothing like it in the last two years. They are present throughout the spring, but Sept. 17-26 may have been too late for such aggregations in 1917. Young was present all the summer of 1918 and only noted occasional birds through April and May, so it is probable that the above increase was only momentary and was checked by the continued ecological changes in the locality.

27. *PINTAIL, *Dafila acuta.*

Was a common breeder. Said by the Ward brothers to mature earlier than any other species of duck except the Hooded Merganser. More Pintails were seen during the spring of 1917 than any other kind of duck. In 1918, Young found them very common in early May, gradually reducing in numbers after the middle of the month, scarce in midsummer, which here gives no cover for eclipse conditions. The last noted were fifty on Sept. 16.

28. WOOD DUCK, *Aix sponsa.*

The Ward brothers give circumstantial accounts of the occurrence of two Wood Ducks at different times. One male taken in 1899 or 1900 was identified as such by a Mr. Robt. Holland, who was familiar with them in Ontario, and the other from memory of that specimen. Whilst these records are not unimpeachable, taking into consideration the striking characters of the birds and the qualifications of our informants, I accept them with but slight reservations.

29. REDHEAD, *Marila americana.*

Arnold found nests in 1894 and the Wards say that it used to breed. We saw only occasional specimens during spring and fall.

30. *CANVAS-BACK, *Marila vallisneria.*

Said by the Wards to have been a common breeder in the past. A female was taken on June 6, 1917, but it proved to be a non-breeder. We have only seen occasional individuals in spring and early summer.

31. *LESSER SCAUP, *Marila affinis.*

A considerable number of Scaups were noted during both spring and fall. All taken proved to be the Lesser Scaup, though undoubtedly the Greater Scaup also occurs. The Wards know of but one nest being taken, that one being amongst the gulls on an island.

32. *RING-NECKED DUCK, *Marila collaris.*

Nothing like as common as the Scaups. A few were observed in the spring of 1917 and specimens taken in the following fall. It was not observed by Young in 1918. The Wards know it under the name of "Buck-eye", and say that it occasionally occurs in small flocks but do not know of its breeding.

33. AMERICAN GOLDENEYE, *Clangula clangula.*

A flock of six were seen between May 17 and 23, and a pair hung about until the first week of June in 1917. Young noted one on July 11, 1918. All adult males observed were of this species. We have no record of its breeding.

34. BARROW'S GOLDENEYE, *Clangula islandica.*

Seton (*Auk*, 1886, p. 328), cites R. H. Hunter as authority for the capture of a drake on Shoal

Lake in the spring of 1880. It is a long way from normal range of the species and should be authenticated by specimens for unreserved acceptance. The Wards are unacquainted with the species.

35. BUFFLEHEAD, *Charitonetta albeola.*

Said by the Wards to have been a common migrant, but not known to breed. Seen on May 19, 1917, and a few in late April and early May in 1918.

36. HARLEQUIN DUCK, *Histronicus histronicus.*

Frank Ward tells us that in the spring of 1898 he shot three brilliantly coloured little ducks that he was unfamiliar with. At the time he thought they might be Wood Ducks, but upon seeing that species later realized the mistake. He identified them as similar to coloured pictures of the Harlequin Duck in Reed's Bird Guide. Taking everything into consideration I am inclined to accept this record with but few mental reservations.

EIDER, Sp?

The Wards tell of a large duck of unknown species, with greatly swollen bill, having been taken by Mr. Samuel Martin, of Winnipeg, about 1900. Plumage descriptions seem to suggest a female, either Eider or Scoter. If Eiders, ever occur they must be accidental stragglers and except for the above uncertain record they are unknown on the lake.

37. WHITE-WINGED SCOTER, *Oidemia deglandi.*

Seton found nest and eggs on Pelican Island on July 6, 1901. This is the only Scoter known to the Ward brothers, who say that when the lake was fished many were taken in the nets. We saw small flocks almost daily in the spring of 1917, and Young reports occasional individuals throughout the season until Aug. 10.

38. RUDDY DUCK, *Erismatura jamaicensis.*

Reported by Seton, 1886, on the authority Hine to breed at Shoal Lake. Said by the Wards to have bred very commonly but not often taken. It has practically disappeared from the marsh since the drying of the marshes. Young noted one individual on May 29, 1918.

39. SNOW GOOSE, *Chen hyperboreus.*

Single individuals seen on May 25 and 28, in 1917, a large flock on April 30, a smaller one on May 25, and two individuals on Oct. 2, in 1918. The residents are enthusiastic over the "Wavie" shooting. I take it for granted that all are Lesser Snow Geese, *C. h. hyperboreus.* It is locally called Greater, but apparently in contrast with Ross' Goose, which sems to be as well known as the "Lesser Wavie".

40. BLUE GOOSE, *Chen caerulescens.*

One was seen on May 29, 1917, in company with a Snow Goose and watched for some time in good field-glass range. The slaty black and white head and neck made identification positive. Young noted a flock of one hundred on April 30, 1917, and a few more individuals on Oct. 1 and 2. The Ward brothers say that in most flocks of Snow Geese a few of this coloration occur, but not many are taken.

41. ROSS' GOOSE, *Chen rossi.*

The Wards differentiated between the Greater and Lesser Snow Geese, but upon questioning it appeared that the latter were little larger than Mallards. There can be little doubt but that this is the species referred to. They are only occasionally seen on the lake, but numbers have been brought into Winnipeg market.

42. WHITE-FRONTED GOOSE, *Anser albifrons.*

May 26, 1917, one pitched on an isolated rock off the shore within sight of camp, from whence we watched it with glasses for a considerable time. The general brown colouration, white frontal patch and pink bill and feet were plainly visible and there can be no doubt as to the identification. The Ward brothers say it is scarce within their experience and know of but six individuals being taken on the lake.

43. *CANADA GOOSE, *Branta canadensis.*

Besides seeing the species during spring and fall in 1917, Young noted individuals as late as June 4 and as early as Aug. 10 in the following season. Arnold reports finding a nest on an island in 1894 and doubtless the present breeding ground is not far away. Two captive birds seen were evidently *B. c. hutchinsi.* One specimen obtained on April 30, 1918, is *B. c. canadensis.* The Wards and others say that the two large forms of Canada Goose can easily be told apart in life, having different voices and the flocks keeping more or less separate. The living birds of the small form do not make good decoys for the larger. They also upon their own initiative tell of occasional very small Canadas, scarcely larger than Mallards, and with voices like a hard *cack-cack-cack.* They are very scarce and there can be little doubt but that they are stragglers of the Cackling Goose, *B. c. minima.*

44. BRANT, *Branta berniola.*

Reported by Seton (*Auk*, 1886, p. 329), on authority of R. H. Hunter, to have been killed at Shoal Lake. As Geo. Atkinson records in his Rare Birds of Manitoba (Trans. No. 65, Hist. and Sci. Soc. Man, 1904), a specimen in his possession from Oak Lake, killed the spring of 1889, the record is not an isolated one for the province.

45. WHISTLING SWAN, *Olor columbianus.*

The Ward brothers tell us that Swans are still common migrants, especially in the fall and do not seem to be decreasing to any marked degree. We saw none in 1917, but in 1918 Young noted thirty on April 30, and six on May 6.

46. TRUMPETER SWAN, *Olor buccinator.*

The Ward brothers have observed Swans of two different sizes. One shot in 1904 weighed thirty-two pounds and was so large that Frank Ward, a large man, could not close his hand about the neck behind the head. Mr. Ward, Sr., says that swans nested on the lake in 1893-94 and that he watched the old one with cygnets one day for hours. This can only refer to the Trumpeter Swan and is strong circumstantial evidence of its occurrence. Our informants also tell us that the big swans are not as wary as the small ones, do not keep as consistently in the centre of the open lake, and are more easily taken. The voice is also quite different from that of the smaller species, being either a single "*Whoop-Whoop*" or a louder, clearer, and less shrill "*Coo-coo*——" that can be plainly heard for miles. Frank Ward tells of a wounded one uttering a long drawn note of such extreme mournfulness that it moved him deeply, thus substantiating, in a measure, the fabled song of the dying swan. These trumpeters do not come with the large flocks of Whistlers, but usually as individuals accompanied by one or two dark cygnets. Two have been seen as late as the early spring of 1917.

(To be continued.)

The asterisk (*) denotes that specimens were taken.

THE ORCHIDS OF HATLEY, STANSTEAD COUNTY, QUEBEC.

By H. Mousley.

In that interesting book, "How to Know the Ferns", Mrs. Theodora Parsons recounts how a friendly rivalry used to exist amongst fern students as to who could claim the greatest number of species for a given area. Possibly if such a rivalry exists amongst students of the orchid family, I might take a prominent place, for I can lay claim to having found seventeen species and one variety of orchids (or just one-quarter of all those known to occur in Eastern North America) within a radius of one mile of my residence, and I am beginning to wonder whether Hatley is not an "El Dorado" for these lovely flowers, the same as Dorset and Pittsford (both in the State of Vermont) are for ferns. On a two hours' walk in the former place thirty-three species and four varieties of ferns have been found, but then it must be remembered that the party finding them had made the study of ferns a speciality, whereas I do not lay any claims to being considered a specialist in orchids or even a botanist. Still from childhood I have always had an innate love of the beautiful, and it has been whilst pursuing my favourite study of ornithology, that I have made a side line, so to speak, of botany, having collected and named some two hundred or more local species of wild flowers, at odd moments when from some cause or another birds were scarce. Possibly I owe my success with the orchids almost entirely to the warblers, for in making a special study of this family of birds, I generally seem to have been most fortunate in securing my rarest finds, the following up of a Cape May Warbler *(Dendroica tigrina)* for instance giving me my first sight of that exquisite little orchid, *Calypso bulbosa.*

Hatley is a pretty little village lying at an elevation of 1,000 feet above the sea level, the country all round being of an undulating character with plenty of small streams, many of which eventually find their way into Lake Massawippi, a fine sheet of water about nine miles long, lying on the western side of the village. Between this lake and the village there stretches a long belt of low-lying woods composed largely of spruce, fir and cedar, with hemlock, maple, birch, beech, ash and other deciduous trees intermixed. It is in these woods principally to the north-west of the village that most of my records have been made, although there is a famous bog to the north-east, where several species are to be found growing in profusion including *Arethusa bulbosa.*

During most of my eight years' residence here (1911-1918) I have resided about one and a half miles to the south of the village, but in May, 1917, I made a temporary change and occupied a house about a mile or rather more to the north of the village until October, 1918. Previous to making this change I had only observed six species of orchids to the south of the village, so that my change of residence is responsible for an additional twelve, the ground being of a more swampy nature and better suited to the requirements of orchids, although I do not wish it to be understood that a systematic worker could not find any of these twelve additional ones to the south or east of the village, for indeed I myself have already done so during the present year (1918); nevertheless I think the localities indicated will be found to be the most productive, as the following annotated list (taken in the order given in Gray's Manual of Botany, Seventh Edition) clearly shows:

SMALLER YELLOW LADY'S SLIPPER, *Cypripedium parviflorum* Salisbury. My first acquaintance with this fragrant flower was on June 22, 1917, when I found a little bunch of nine blooms on the outskirts of some woods that had been cut down and had partly grown up again with willows. Although I searched the ground very carefully for a good radius round, I could find no more, and it was not until May 29, of the following year, that I came across three more blooms near a logging road in the centre of a wood three miles to the south of the first locality, which was one and one-half miles to the north-west of the village, whilst the latter place was one and one-half miles to the south-west, both of them being of a very swampy nature. This is a much smaller bloom than the next variety, but what it lacks in size it more than makes up for in richness of colour and perfume.

Var. *pubescens* (Willdenow) Knight. (LARGER YELLOW LADY'S SLIPPER). On June 18, 1917, one of the village pupils brought two of these blooms to school, she having found them in some woods to the east of the village. The following year in the same direction, and on the same date, strange to say, I found several clusters of blooms in an open space in a dry deciduous wood on some hilly ground, and had previously, on June 6, come across a few examples in another wood to the north-west of the village. These latter examples were quite fresh, but those found on June 18 were far gone, although the two of the year previous on the same date were perfectly fresh. I am inclined to think this variety will be found to be much commoner than the species (for I have since heard that it was taken on June 1, near Compton, a village seven miles to the north-east of Hatley); at all events its habitat is more accessible to most people, being in dryer situations than that of *parviflorum*. The blooms although very much larger than the latter are decidedly paler and lack the exquisite perfume of the former.

SHOWY LADY'S SLIPPER, *Cypripedium hirsutum* Miller. For several years, in fact until 1917, I only knew of one locality for this the handsomest of the Cypripediums if not of all our native orchids, which was on the borders of a little tamarack swamp rather over a mile to the south of the village, where, however, never more than some half-dozen blooms could be found in any one season. Side by side with *hirsutum* only blooming a little earlier, could be found that charming flower (immortalized by Emerson) Rhodora *(Rhododendron Rhodora)*, this little swamp being also the only locality known to me for the species up to last year (1918), when I heard of another somewhere near Compton. In 1917, on June 23, I discovered another locality for *hirsutum* in the bog already mentioned to the north-east of the village, but on this date only a few blooms were noted. However, in the first week in July, in this same bog, but somewhat further to the north, I came upon it again, together with *Arethusa bulbosa* and *Habenaria dilatata* literally growing in profusion. It would be impossible to describe my feelings at the time, the blooms of the first named in scores, alone forming a never-to-be-forgotten sight. On June 21 of the following year, I again visited this spot to see how things were progressing, but was horrified to find that a severe frost on the nights of the 18th and 19th had worked terrible havoc, all the plants of *C. hirsutum* being laid flat on the ground in a dead and blackened state and not a bloom could I find, whilst *A. bulbosa* and *H. dilatata* were not much better, although I did succeed in finding two fine blooms of the former in a very sheltered spot, and several of the latter, the date, however, in both cases being somewhat early for these species. In its early stages the foliage of Indian Poke or False Hellebore *(Veratrum viride)* is much like that of *C. hirsutum*, and is no doubt often mistaken for it by the novice. My dates for fresh blooms of *C. hirsutum* (which are fragrant) range from June 14 to July 17.

STEMLESS LADY'S SLIPPER, MOCASSIN FLOWER, *Cypripedium acaule* Aiton. It was not until this year (1918) that I was able to locate this beautiful orchid, although I had heard rumours of its having been found many years ago in a wood to the west of the village, this exact locality being given to me by the finder himself when visiting Hatley on business in July, 1917, too late, unfortunately, for me to do anything that year. In the following May, however, I visited the spot on the 25th, and after an hour's search found some twenty-five blooms or more in a portion of the wood where there were a number of hemlock trees. The day previous I had accidentally come across five blooms (also under hemlock trees) in a little ravine three miles to the north of Ayers Cliff or about ten miles from Hatley, After this I found a few plants in three other localities, two to the north-west of the village, and the other to the south-west. In one of the former I had a red-letter-day find, for I came across two blooms on June 18 in both of which the large lip was snow-white instead of pink. Gray, in his Manual, says lips rarely white. These two blooms were close under the drooping branches of a fir tree on the north side, where it was impossible for the sun to ever reach them, the spot, however, being a very dry one. In every case with the exception of the last named the plants have been found under or in the vicinity of hemlock trees, and in the case of the twenty-five or more, some of these were growing on fallen tree trunks which were in a crumbling state. My dates for fresh blooms range from May 24 to June 18.

SHOWY ORCHIS, *Orchis spectabilis* Linnæus. I first became acquainted with this early blooming orchid on June 1, 1912, when in a wood two miles to the south-east of the village I found seven blooms, but although I often visited the spot in after years I never found any more, and it was not until June 6, 1918, that I came across it again in a wood a mile to the north-west of the village, one solitary bloom, however, being all that I could find, and it was over. One of the village school children had previously shown me a bloom on June 1 that he had found in a wood not so very far from Compton, and he said there were a few more. From this it looks as though the species is fairly well distributed, but nowhere very plentiful.

Habenaria bracteata (Willdenow) Robert Brown. It was only in May of last year (1918) from the 20th to the 27th, that I came across this green orchid (of which I do not know the exact vernacular name) in a wood one mile to the north-east of the village, and then only a few blooms were discovered. However, I do not suppose it is particularly rare, but may be somewhat local seeing that I have not noticed it in previous years. Many of the Habenarias, however, are inconspicious and can be easily overlooked.

Habenaria hyperborea (Linnæus) Robert Brown. This is another *Habenaria* of which I have no exact vernacular name, but it is a very common and widely distributed one here, as well as being very variable both as regards its height and size of flowers, etc. My dates for fresh blooms range from May 31 to July 1 at all events, if not much later. It seems to favour cold, wet and boggy woods principally.

Northern white orchis, *Habenaria dilatata* (Pursh) Gray. There is only one bog about a mile to the north-east of the village where I have found this species, but there it grows in profusion as already stated in the account of *C. hirsutum*. My dates for fresh blooms range from June 21 to July 17.

Small northern bog orchis, *Habenaria obtusata* (Pursh) Richards. This little orchid with its cluster of greenish-white flowers is very common and well distributed, at least in the long range of woods lying to the north-west of the village, where in the cool mossy parts one can hardly avoid crushing it under foot. In 1918, the single leaf was just appearing on May 4, the blooms on June 17, and they lasted until July 11, or perhaps a little later.

Small purple fringed orchis, *Habenaria psycodes* (Linnæus) Swartz. Probably this is the commonest and most widely distributed of all the orchids to be found here. Damp meadows, swamps and even roadsides are al lequally likely places to find this species from about July 19 to well into August.

Arethusa, Indian pink, *Arethusa bulbosa* Linnæus. This very lovely magenta pink orchid named after Arethusa, one of the nymphs who attended the goddess Diana, grows in profusion in the quaking bog about a mile to the north-east of the village as already stated, and this is the only locality I know of where it is to be found. I have noted it in bloom from June 21 to July 17, and also that it seems to prefer the little mossy hummocks in the bog, which keep it out of the water, whereas *H. dilatata* is found in the grass and moss at a lower level and in the very wettest places.

Wide-leafed ladies' tresses, *Spiranthes lucida* (H. H. Eaton) Ames. If numbers count for anything then this rather insignificant little orchid with its yellowish lip is my rarest find, for I have only located one solitary example so far, on July 20, 1918, on a moist bank in the vicinity of the famous bog to the north-east of the village.

Nodding ladies' tresses, *Spiranthes cernua* (Linnæus) Richard. In striking contrast to the above this species can be found almost anywhere not only in very wet situations, but also in comparatively, if not entirely dry ones. The perfume from a number of spikes is very noticeable and pleasant. My dates for fresh blooms extend from August 17 up to as late as October 17.

Spiranthes Romanzoffiana Chamisso. I have no specific vernacular name for this species of Ladies' Tresses, but its scientific one is high sounding enough for anything. It is well distributed, but not quite so abundant as *S. cernua*, appearing somewhat earlier however, my earliest date this year (1918) being July 24.

Lesser rattlesnake plantain, *Epipactis repens* var. *ophioides* (Fernald) A. A. Eaton. The rosette of snake-like marked leaves forming the base of this orchid is certainly its most striking feature, and not the somewhat inconspicuous spike of greenish-white flowers. I have found it in some half a dozen localities in the wods to the north-west and south-west of the village, but never in any of those on the eastern side, with one exception, and that was several miles from Hatley, on the wooded slopes of Barnston Pinnacle. Although I first found it in 1915 by means of its leaves, it was not until August 1, 1918, that I came across it in bloom.

Listera convallarioides (Swartz) Torrey. I have no specific veracular name for this Twayblade, which, however, is a common enough species, at least in the woods to the north-west of the village, growing side by side with *H. obtusata*. I first found it in bloom on June 27 of the present year (1918) and it lasted until about July 11 or perhaps a little later.

Coral root, *Corallorrhiza trifida* Chatelain. This is one of those inconspicuous little plants which if you are an orchid enthusiast it is advisable not to show to your friends for fear of some very sarcastic remarks. I only found it in one wood to the north-east, and in two others to the north-west of the village this year (1918), between May 20 and

June 15, but never more than two or three blooms at a time.

CALYPSO, *Calypso bulbosa* (Linnæus) Oakes. Never shall I forget the day when I first discovered this exquisite and very local little orchid rightly named after an immortal. It was on the morning of May 15, 1918, whilst following up an equally rare warbler, the Cape May *(Dendroica tigrina)* to the edge of a deep cedar swamp, that I had not previously explored, and which curiosity now prompted me to enter, that I came upon two blooms on the moss-covered stump of a fallen tree. Needless to say I spent a long time searching in a wide radius round this spot, but I only succeeded in finding five more blooms. This success, however, was sufficient to make me ignore the birds for the rest of that day and the one following, in an endeavour to define the extent of the area and the abundance or otherwise of the plant. I only succeeded, however, in locating three more blooms (thus making a total of ten in all) and each of these three were by themselves, one at a distance of perhaps three-quarters of a mile, another at about one-quarter of a mile, and the last only a few hundred yards from the original spot. These three localities with the original one were all within the long belt of woods lying to the north-west of the village.

It seems strange that in *The Canadian Naturalist*, Gosse, 1840, a book of much local interest (as it gives a general account of the Flora and Fauna of the district in those times) the word Orchis occurs only once, and that on page 299, where the author (who lived at Compton, a village some seven miles to the north-east of Hatley) on September 10, 1838, or thereabouts, says: "I found an Orchis, consisting of two very large oval leaves, deeply plaited, but it had no flower". Considering that Gosse spent three years at Compton it would appear as if orchids must have been very scarce here in those days, or surely he could hardly have failed to notice some of the more showy ones. Probably the one he found was *C. acaule.*

In conclusion, I hope this preliminary list may be the means of inducing others to try and add to it, as I feel sure the possibilities of the place have only been touched upon so far.

BIRD LIFE IN THE ALBERTA WILDS.

BY J. DEWEY SOPER.

When visiting western Alberta during the months of October, November and December, in 1913, I had an opportunity of studying, each day, many species of winter birds which were then new to me. The birds of that region, I believe, have had few admirers at that date. In briefly sketching these I am denied perhaps the satisfaction of viewing the list as a complete exposition of the winter birds of the region, but it seems, except in special instances, that a great deal of our interesting contributions in this direction is necessarily fragmentary, through lack of adequate opportunity.

We camped the entire period in the valley of the Hay river, some thirty or thirty-five miles north of the entrance to the Yellowhead Pass. This country is reached by pack-horse from either Hinton or Dyke. The Grande Prairie trail intersects this region, and running roughly parallel to the first majestic ranges of the Rockies, affords splendid opportunities for viewing their grandeur. All of those exceptionally fine mountains, Broule Roche, Roche a Perdrix, and Roche Mutte, may be seen from this trail.

The country is rugged, with a mixed forest of pine, spruce, poplar, and birch. Much of it has been burnt over by forest fires. The entire region is interspersed with numberless small lakes.

Large game and fur-bearers were not plentiful in the exact country we visited, due to persistent hunting by the Crees which inhabit it.

The list may prove interesting, following as it does, at an advanced season of the year, Riley's bird list for practically the same region, also Taverner's recent addendum to the same.

(1) During the early part of October, the WESTERN GREBE (*Æchmophorus occidentalis*) was tolerably common about the small lakes adjacent to the Hay river valley. They occurred with greater frequency, it seemed to me, on the lakes that had no visible outlet. These perhaps possess more food peculiar to their wants. Sometimes they were solitary, but more often were observed in pairs. As the days went by and the nights became colder they became fewer in number and the last individuals observed before the freeze-up was on October 28th.

Later while travelling over the ice during the first week in November, I found two of these birds frozen down on the surface, both in a frail and starved condition. It would be interesting to know the exact circumstances which prevented these birds from migrating earlier. Both individuals were found on the same lake and only about a mile distant from the open waters of the Hay river.

(2) THE HUDSONIAN SPRUCE GROUSE (*Canachites canadensis*) was a very common bird in the big woods and usually seen in flocks. When first

encountered the flaring red margin to the eye and the comparative darkness of the species, especially the male, impresses one greatly. Next, if the observer has formerly pitted his cunning against the Ruffed Grouse of the east he will be very agreeably surprised at the utter confidence the bird exhibits when closely approached. With perfect nonchalance he remains perched close overhead, blandly surveying the newcomer stretching his neck to full extent, and moving his head in different directions, fearing, I suppose, to miss anything of interest. In fact many birds are so foolishly confident that Indianas and others call them "fool-hens" from the display of this excessive tameness.

I was told that the Indians killed many with simply a stick, or snared them from the tree, catching them by means of a small wire noose on the end of a pole, manipulated by the hunter. I tried this myself and was so nearly successful that I was satisfied it could be accomplished.

These birds afford excellent eating and are largely taken in the wilderness for the benefit of the traveller. The flesh of this species is darker and the heart larger than that of the Ruffed Grouse. Their crops, as winter approaches, are found to contain an increasing proportion of pine needles, for instance the crops in specimens taken in December were found to be entirely filled with these needles.

(3) What I have already written of the Spruce Grouse is largely applicable to the GRAY RUFFED GROUSE *(Bonasa umbellus umbelloides)* of this region. They, too, are a comparatively fearless bird but not to such an extent as the former species. They are quite numerous and occur in about equal ratio with the Spruce Grouse; if there is any difference I believe it would be in favor of *umbelloides*.

(4) Numerous small flocks of the SHARP-TAILED GROUSE *(Pedioecetes phasianellus campestris?)* were observed during October upon the bald open crests of the lesser hills, where conditions more nearly approached those of the prairie. Unfortunately I failed to collect any specimens, so am unable to state whether these were the northern variety *phasianellus*, or what is more probable, the prairie form *campestris* which is common at Edmonton, two hundred miles east. Spreadborough, in 1898, according to Macoun's Catalogue of Canadian Brds, failed to observe the species farther than 25 miles west of Edmonton. The extension of the range of this species, during the intervening fifteen years, can I believe, be attributed to the extensive settlement of the country during that time.

The birds were extremely wild and took to wing at the first sign of approach, emitting their familiar *cack, cack, cack* like the grouse of the prairie but unlike them, did not fly to near-by tree tops, preferring rather to fly away until lost to view.

(5) GOSHAWKS (*Accipiter atricapillus*), were not uncommon thoughout the region. The complete isolation and ruggedness of the country, with abundance of small game, suited their rapacious natures to a nicety. I collected both adult and young birds; one of the latter shot on October 30th, measured 22 inches in length, with a wing expanse of 3 feet 5 inches. The immature birds are dark brownish over the back instead of the bluish gray of the adult.

(6) GOLDEN EAGLE (*Aquila chrysaetus*), were frequently observed. One fine specimen which accidentally found its way into one of our fox traps, afforded us a lively and interesting time before we finally liberated him. Measurements of the bird were: length three feet, expanse seven feet one inch. The region is well suited to these large birds of prey.

(7) HORNED OWL (*Bubo virginianus subarticus*) were evidently permanent residents as I frequently heard them hooting on fine nights during my entire stay. They prey largely on that scourge of the wilderness the Varying Hare.

(8) THE HAWK OWL (*Surnia ulula caparoch*) was the first bird noted on our way to the Hay river. The first individual and the first one I had ever seen was perched upon a slivered stump about fifteen feet from the ground. At first sight I thought I had a hawk under observation due to the trimness of the bird and the long tail, but the big face presently turned towards us soon convinced me of my error. I was much amused at the habits of this little owl, as he sat so upright there in open day, as our outfit shambled down the trail almost below him, and except for a casual turn of the head, exhibited but little interest in the party. They were tolerably common throughout the region traversed. Their food consists largely of the smaller mammalia as their action about low beaver meadows would indicate. One day I flushed a Hawk Owl from the ground and found that he was feeding on a full grown hare. If, as I suppose, the bird killed this animal itself, the action was certainly a creditable one for a bird of this size.

(9) One individual only of the PILEATED WOODPECKER *(Ceophloeus pileatus abieticola)* was observed and it was collected. They are very shy and retiring.

(10) The only other woodpecker noted was the NORTHERN HAIRY WOODPECKER *(Dryobates villosus leucomelus)*. It was common in all heavy timber. The three-toed species should no doubt have been observed here, but none were seen although at Edmonton they occur occasionally. Richardson* states, "The Hairy Woodpecker exists as far north as 63°. It remains all the year in the Northwest

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*Macoun's Catalogue of Canadian Birds.

Territories, and is the commonest species up to the 56th parallel, north of which it yields in frequency to the three-toed species." This very well confirms the scarcity of the three-toed varieties and the abundance of the Hairy Woodpecker in this instance, but should scarcely account for the entire absence of the former when they occur at Edmonton in practically the same parallel, namely 53°, 35′ north.

(11) Canada Jays (*Perisoreus canadensis*) were everywhere common, as I suppose they are in most northern woods. No sooner is camp made for a short time, than suddenly they appear to make friends, with plaintive mewings, or harsh *ca-ca-ca's*, and other peculiar notes. They are very inquisitive and social birds and afford real interesting study in their ways and habits.

I have spent many exhilirating moments watching these insatiable elfs, greedily stowing away food, gulping and choking and still trying with greater efforts to extend their capacity. What is impossible for them to eat at the time is very cunningly carried away and secreted in niches of nearby trees. They have no aversion to very questionable eatables, as a note from my journal of December 2nd indicates, and illustrates nicely this voracious tendency:

"Whisky-jacks carried away my last cake of Lifebuoy soap to-day, but fortunately I found it some distance away beneath the spruces, where they had conveyed it for greater secrecy. To my amusement they had eaten a generous sized hole from the centre. It would be interesting to know how they feel."

I subsequently learned that the soap and its influences detained my little friends from making their usual appearances for three consecutive days, but at the end of which time, after fearing the worst, they ambled in again as hale as ever.

This disposiion of *canadensis* leads many woodsmen to indulge in harmless trickery upon the luckless birds and become convulsed with laughter at the ludicrous pranks they play: for instance, on the end of a string with mealy tid-bit attached.

(12) Ravens *(Corvus corax principalis)* were observed only on two occasions, both during the month of October.

(13) Pine Grosbeaks *(Pinicolo enucleator leucura) or Pemontana?* (14) Redpolls *(Acanthis linaria)*, and (15) Siskins (*Spinus pinus*) were very common; the two former becoming much more so after November 10th.

(16) I saw only one flock of White-winged Crossbills (*Loxia leucopter*) which were feeding on a low spruce near the Hay river on November 5th.

(17) Near the same place on the afternoon of October 25th, I came upon a solitary individual of the Gray-crowned Leucosticte (*Leucosticte fephrocitis*); it was the only one observed on the trip.

(18) A single Tree Sparrow *(Spizella monticola ochracea)* in company with a number of (19) Juncos *(Junco hyemalis* or *Junco oregonus shufeldti)* was noted on October 29th. They frequented low shrubbery, skirting a small brook that emptied into the Hay river.

(20) The American Dipper (*Cinclus mexicanus unicolor*) was always to be seen along the open ripples. When a "Chinook" blew for a time from passes to the west, and flooded the ice and extended the open places it suited the little ousel all the better. It always is a matter of interest to watch the little fellows diving deep into the cold spray of the stream and come up bobbing serenely, with a mouth full of green litchen or algae. They then convey it to the margin of the ice and select from it what suits them best. Their feeding places are marked on the ice by long narrow lines of green litchen grass, and little bits of gravel and silt.

What pleases me is the solemn air of importance they frequently possess, paddling around on the stream, head erect, bobbing over the ripples like a miniature duck and all the while in their comical erratic behaviour, twisting and turning suddenly this way and that as suits their fancy.

They frequently resort to the tree-tops when disturbed, displaying a surprising range of adaptability, when it is remembered that they are, comparatively, expert in the water and very active on land. They are truly very interesting little birds.

(21) In the darkest and loneliest coniferous forests of the greater foothills, I discovered the only place frequented by the Red-breasted Nuthatch (*Sitta canadensis*). Here they occurred in great numbers, the gloomy spruces seeming alive with them in certain places, and their thin nasal *ya-na-, ya-na* murmured incessantly down the stillness of the forest. The mystery of the great conifers draped in clinging moss, with the calls of winter birds, casts quite an enchanting spell upon the otherwise breathless silence.

(22) Black-capped (*Penthestes atricapillus suptentrionalis*) and (23) Hudsonian Chickadees (*P. hudsonicus hudsonicus*) occurred in about equal numbers, and the occason lent itself very agreeably to an extended acquaintance with *hudsonicus*, of which until this time I had seen but one living example. At Edmonton, comparatively but such a short distance east, I never saw them. Their notes are much coarser than those of the Red-cap or Long-tailed varieties and serve to quite accurately identify them at a distance.

THE BEHAVIOUR OF THE RED SQUIRREL.—II.

BY A. B. KLUGH, M.A., DEPARTMENT OF ANIMAL BIOLOGY,
QUEEN'S UNIVERSITY, KINGSTON, ONT.

The Red Squirrel, of whose behaviour I gave an account in the April number of THE OTTAWA NATURALIST, is still under observation, and I have been able to obtain some additional data concerning it. It is no tamer than it was last year and this fact allows us to regard its activities as typical of the species in the wild state.

A fact which has come out very clearly in the course of my prolonged observation of this squirrel is that it possesses an individuality of appearance. Its characteristic appearance is something practically impossible to define, but is none the less easily recognizable. It is a matter of "expression", as I find that I can be sure that it is Adjidomo, which is Ojibwa for Red Squirrel and the name by which I refer to this individual, only if I get a look at his face. When I look at the face of either of two other Red Squirrels which live in the vicinity I know at once that they are not Adjidomo. The other two squirrels I cannot tell apart, though it is probable, if not certain, that they too have a characteristic appearance which would be revealed by close and frequent observation.

FOOD.

One rather interesting point in connection with the food-habits of the Red Squirrel became apparent during the summer. I had always regarded bark as being a food material which was only made use of by the squirrel as a last resort—a "starvation diet" to be used only when other more attractive foods were not available. But during the summer and fall, though the squirrel was well supplied with various articles of diet, such as nuts, bread, meat, etc., he continually made meals of the bark of the hard maple. He chisseled off the gray outer layer and ate the greenish and white inner layers. The maple bore no seeds this year, and what natural food resource the squirrel could have used this winter is hard to see. The only one I know of is the horse chestnut, and during the fall he stored a good many of these.

STORAGE.

A few more points in connection with the storage of food have been observed. One fact which stands out quite clearly is that when an object is being placed in position for temporary storage it must rest against something, as well as on something. The object is usually placed in a fork of the tree, as mentioned in my previous article, but any angle, such as that formed by the top rail of the verandah and a post, will serve, and even a splinter projecting from the surface of a board will satisfy his idea of stability. It appears as if the main idea underlying the operation is to keep the object from rolling.

The squirrel often has some difficulty in deciding upon a suitable location in which to deposit an object and frequently carries a piece of food round from place to place, trying several locations before finally depositing it. Further than this, it is not always satisfied with the place it has selected and returns, hauls out the object and deposits it in another place. This may be done almost immediately after it has been first placed in position or after the elapse of half an hour or so. If it takes a large piece of food from its location and eats a portion the remainder is almost invariably deposited in a new place.

During the summer, at a time when I was not supplying any nuts, he went to his main store under the shed, brought out nuts stored in the spring, carried them up the tree and ate them.

At the end of November, when a little snow had fallen, he buried food in it. The layer of snow was not deep enough to enable him to use his usual method of shoving the object into the snow with his muzzle and scraping snow on it from right and left with his paws, so he turned his paws over so that the palms were upward and shovelled snow on the object in this manner.

OWNERSHIP OF STORES.

Adjidomo has apparently lost the chief menace to the food which he stores in the forks of the tree, as the other squirrel which used to raid these stores has disappeared. I have not seen it since May. But there are still several other "pests" which pilfer his stores and have to be chased away. A pair of White-breasted Nuthatches frequently visit the tree and in trying to eat the pieces of food lodged in the forks usually manage to knock most of them out. A Downy Woodpecker and a Hairy Woodpecker also play the same game. The House Sparrows are also a constant source of annoyance to him, and he chases them with great dash and wonderful agility. Time and time again I have seen him spring almost on top of one of them, and it often looks as if he could have seized the bird if he had so desired. When chasing the sparrows he bounces about among the branches for all the world like a rubber ball, and one day when pursuing one of them on the verandah I saw him make what I regard as the most remarkable spring I have witnessed—a leap of five feet with a rise of three feet. It is to be noted that all a squirrel's long leaps are taken from a higher to a lower elevation, and I have observed that Adjidomo will not attempt a long leap except under these conditions.

RESTING.

During the hottest weather of the summer he rested more than at other times of the year. He selected a shady place on a large limb and stretched himself out at full length.

SUNNING.

Last winter I was somewhat puzzled by the squirrel's fondness for a perch which did not strike me as particularly comfortable—on a large nail in the trunk of the tree to which a clothes-line is attached. This perch was not used during the summer, but with the return of colder weather he again frequents it, and it is now plain that he takes up his position there because he is then sheltered and gets the full afternoon sun.

In connection with the squirrel's use of this perch a little episoode occurred for which I can offer no explanation, but which caused us some annoyance. One day when the line held its full quota of clothes the squirrel cut it through at the point where it was attached to the nail, with somewhat disastrous consequences to the "wash". Subsequently he again cut the line down when it was empty, but since then he has left it intact.

LISTENING.

I have noticed that the squirrel has two attitudes which are assumed in intent listening. If it is on "all fours" it folds one front paw, nearly always the right, and places it against its breast. If it is sitting up it folds both front paws and brings them together against its breast. In both cases the head is elevated and is often turned from side to side.

PLAYING.

This squirrel is at least three years old, how much older I do not know, but it frequently plays. When the first snow-fall came it plunged about in it, dashed through the deep piles on the large limbs and evidently enjoyed itself thoroughly. It frequently goes through a remarkable performance which we must classify as a game, since it certainly serves no useful purpose. At the top of the trunk of the maple at the point from which the main limbs are given off there is a trough-shaped, vertical cavity, some eighteen inches long with a pocket-shaped bottom. The squirrel gets in this cavity, turns over and over in a series of somersaults, sliding down the trough on his back at each backward turn. He sometimes seizes his tail and rolls about in the pocket holding on to it.

EXPRESSION OF EMOTIONS.

The emotions of the squirrel are expressed mainly by attitudes, more rarely by the voice. Surprise, fear, curiosity, anger, contentment, all have their characteristic attitudes. The attitude of surprise is either one in which the animal draws itself back on its haunches and allows both forepaws to hang from the sides, or else picks up first one fore-paw and then the other. In fear the body is flattened, head dropped, tail straight out. Anger is shown by the stamping of the hind feet, and jerking of the tail, sometimes by the stamping of the front feet as well. In curiosity the neck is stretched out to a surprising length. In the attitude of contentment the animal is usually sitting up with the tail flat along the back and the tip over the ears. These emotions are well-defined but as to whether joy finds expression in behaviour I have not yet definitely determined, though I have noticed a certain high bounding which it exhibits only when it has discovered a supply of food.

The voice seems only to be used in anger and pain. The scolding chatter is familiar to everyone, but I have observed that Adjidomo has chattering notes of different quality which he employs apparently in different degrees of anger. A cat excites his most intense wrath, and when he sees one anywhere near the base of the maple he breaks out into a very loud, sharp chatter of such a quality that I can now tell at once the cause of his indignation. It takes him some considerable time to get over a fit of cat scolding, and it is interesting to notice the order in which the different vocal elements which compose the compound chatter die out. The note which persists the longest is the little nasal "Tscherk", and these gradually grow fainter and further apart until his equanimity is restored. The chattering is always accompanied by stamping of the hind feet, which action sometimes is so violent as to become a veritable dance. It might perhaps be claimed that the chatter denoted only excitement and not anger, but this is disproved by the fact that he can get very excited without chattering and that upon three occasions when he has had cause for anger but not for excitement he has chattered. One of these episodes I will mention as typical. I had put two very hard buns out for him. He had some difficulty in getting a firm grip on one of the buns with his teeth because of its hardness and large size, but finally made off with it. He ran up the branch from which he jumps to the roof of the next house, gathered himself together and sprang across. But in mid-air the bun slipped and fell to the ground. The slipping of the bun upset his leap, but he managed to alight safely, though far from gracefully. He then looked over the edge of the roof after the bun, "registered surprise", (as they would say in the movies), and then chattered and stamped. He soon returned for the other bun, again had a struggle to grip it, carried it up the branch as before, and jumped—with the same result, the bun slipping from his teeth in mid-air. After this second failure he was thoroughly angry, and chattered and stamped for a long time.

I had never heard Adjidomo give vent to a cry of pain, but one day he caught the other squirrel which had been stealing his stores, and apparently bit him so severely that he uttered several high-pitched squeals.

I have never heard Adjidomo use the long, rolling, "Chrir-r-r-r-r-r-r-r" call. This is apparently an inter-communication call and thus is not used by an isolated individual.

MOODS.

Having this squirrel under observation day after day it has become quite apparent to me that he is subject to moods. On some days he is far more nervous and "jumpy" than on others, and the probability is that on these days he has received a bad fright, I say "probably", because I have not yet been able to establish the connection between this condition and its cause. Certainly on days on which he has been made angry he is more irritable than at other times.

BEHAVIOUR UNDER UNUSUAL CIRCUMSTANCES.

In judging the mentality of any animal one of the best tests we can apply is the manner in which it behaves under unusual circumstances. Instinct will look after all ordinary activities, but instinct fails when confronted with new conditions. The ability to meet new conditions successfully implies intelligence.

During the summer the portions of the limbs of the maple which hung over the roof of the next house were cut off, including the end of the limb along which the squirrel travelled on his way to the roof. Soon after this had been done Adjidomo appeared, ran along his old route towards the roof, arrived at the cut end of the limb, paused a moment and ran down the limb and up the next one which projected in the direction of the roof. This limb had also had its end cut off, so he again descended and then tried each limb which lay towards the roof in turn until he found one from which he could spring to the roof. He then continued to use this path for some three or four weeks, and in fact still uses it for his return journey, but he has found that by going a short distance up a nearly vertical branch, which projects from the limb he used in the first place, he can make the roof. Just when he discovered this I cannot say as he was using this route when I returned after a month's absence.

One day the squirrel found a long piece of crisp rind. He tried to carry it off, but finding it too heavy and awkward to handle, he put his front feet on it, and pulling with his teeth broke it in two.

On another occasion I placed a nut with a thread attached to it on the verandah and fastened the other end of the thread. Adjidomo soon came along, seized the nut and started to run off with it, but was stopped with a jerk by the thread. He turned round and tugged for some fifteen seconds, then bit through the thread and carried off the nut.

MEMORY.

When we returned home, after an absence of six weeks, the squirrel, as soon as he caught sight of us through the window, immediately darted over to his old feeding place. Nothing had been placed there during our absence, and the incident is interesting as showing a perfect memory for six weeks, and also as showing that he associated our presence with the probability of a supply of food.

CONCERNING SOME INDIAN PLACE-NAMES IN CANADA.

By Armon Burwash, Arnprior, Ont.

In dealing with Indian place-names we are confronted by two main difficulties. The first is that the Indian languages never having been written ones—that is, written by the people themselves, whose common tongue they were—several forms of the same word are often found to have been in use in the same district, and all conveying precisely the same signification. As an instance of this we have Gitchi, Kitchi and Mitchi or Missi, all of them denoting bigness in any one of its different forms.

The second difficulty is that these languages contain a large number of root-words, which, while denoting a fact, idea, or condition, can hardly be said to have what we understand as a distinct meaning. Take for example saga or saki. It denotes a "bursting out" or "breaking forth" but had been conventionalized to some extent and was frequently used as meaning "the mouth of a river", even where the element of force was completely lacking. And Ibi or Ipi denoting moisture. We find it in Sibi, river, Tipisi, moistened—Nipi or Nibi, water, and many other similar words. We have also the same sound in Ipinean, but there it has nothing to do with moisture, as in that word it denotes payment|

Canada. The most important of all Indian place-names to us is Canada It signifies a village or settlement. It is an Iroquois word and by them is used in that sense to this day. But there is a mystery about it, and it consists in its being an Iroquois word.

Their home, as far as we have any reliable evidence was in central and western New York, while all east of them dwelt tribes belonging to the Algonquin linguistic stock. It therefore seems evident that the Iroquois must at some time have forced their way down to the Gulf of St. Lawrence, and there coming into contact with the whites, have given this country the name by which we know it. Their stay in the east, however, must have been but brief, for the nomenclature of that region bears very few traces of their presence there.

At the time we are considering—and so it is yet—the great majority of the Indians inhabiting what was originally known as Canada was of Algonquin affinity, and so it almost seems as if there were an element of unfairness in naming this country Canada instead of Odana, its Algonquin equivalent.

Quebec. Quebec took its name from the Indian word Kibec denoting "closed off" or more literally "shut up" This alludes to the appearance of the St. Lawrence, which at that point, whether approached from up or down river, appears to be closed off, owing to the position of the Island of Orleans and Cape Diamond.

Ontario. I have never been able to find any definite proof as to the derivation of the word Ontario, but have little doubt that it was derived from an Onondaga word Gontare, signifying "the Lake".

Lakes were not as common in the Iroquois territory as in that of their northern neighbours, but even if they had been the size of Ontario would justify its being called "the Lake".

That Ontario is an Iroquois word is almost proven by the "R" in it. In a copy of "A grammar of the Cree language" written by Joseph Howse, F.R.G.S., I find this: "In the northern dialects (including the Cree and Chippeway) the rabid R is never found."

On the other hand Baraga who on pages 3 and 4 makes an almost similar statement, afterwards on page 301 modifies it by a note to the effect that there were some Crees who could pronounce ra-re-ri-ro, and quotes the names Rimouski (the dog's home) and Restigouche (the small tree) as proofs. In my copy of Baraga, however, I find a note by the late Mr. Lindsay Russell, whose it once was, stating that the R in this case is probably a foreign corruption. And my personal experience, limited though it be, has taught me that while there may be some Crees who can sound the letter R, a great many of them certainly cannot.

It seems an irony of fate that the Crees, known to themselves as the Nehethowuk, should come down to us in history bearing a name that they themselves cannot pronounce, and probably bestowed upon them by their hereditary foes the Iroquois.

But be all this as it may, one has only to glance at a map of Canada and the states adjoining it on the south, to realize that practically only in territory once occupied by the Iroquois and their Huron cousins are found Place-names in which the R occurs.

For these reasons I think it is a fair assumption that Ontario is an Iroquois word and means "the Lake".

Manitoba. Baraga gives this as derived from "Manitowaba"—The Straight of the Spirit". No doubt he is correct in this, but no one of our English-speaking Indians or rivermen would ever have used just these English words, few if any of them would have known what the word straight in this sense meant, for to them a straight was always a narrows.

To the Indian any cause that was beyond his comprehension was "Medicine", and he attributed it to the presence or action of a spirit. At the narrows on Lake Manitoba during certain storms a peculiar roar was heard, caused by the unusual conformation of the shores upon which the waves beat. Though the Indian's hearing was phenomenally acute, he had no knowledge of the principles of sound, and so in his customary way decided that this uncommon noise was due to the presence of a spirit.

As regards the first part of this name it is worthy of remark that the Indian's conception of a spirit was much wider, or perhaps I should say deeper than ours, for it ran all the way from "Kitchi Manitou" the Almighty, the Great Spirit, down to "Manitous" the little spirits, which was the name that he applied to the insects that fluttered and hummed and buzzed around him on a warm summer day.

Saskatchewan. Kissiskahahchewun, "There are rapids". This is the name given to the great river of the country wherein they lived by the western Crees. They called themselves Kissiskahchewunethinuk.

That there should be considerable difference between the dialect spoken by them and that spoken by their cousins on the Ottawa is but natural. The difference in their surroundings and mode of life would account for it.

The plain Crees were men of the open spaces. They were free to travel in any direction desired, either by land or water. The buffalo was their great staple. On its flesh they fed; of its skin they made their clothing and their lodges, and under its robes they slept.

On the other hand the Ojibwa and eastern Crees, while their living was more varied, had to work harder for it. Fish formed a large part of it. The canoe was indispensable to them as the only roads they had were the trails over the portages. Hedged in by interminable forests and impenetrable swamps they were forced to keep close to the streams and lakes.

In one word they summed all this up—Nopiming —"In the woods". For Nopiming when resolved into its root-words denotes "back from the shore". And so it was, for when off the waters they were of necessity in the woods.

Ottawa. This name is generally connected with that of the Ottawa Indians. There is a connection but it is only an indirect one. There is no reliable evidence that the Ottawa Indians ever lived on the Ottawa river. In fact such evidence as can be found is to the contrary, even though the largest county on its banks is named after Pontiac, their great war chief.

Their country was on the north of the Georgian Bay and Lake Huron. Their name meant "The Traders", "adowe" being a root-word denoting trade, and was occasioned by the fact that it was by and through them that a system of barter was carried on between the natives north and west of Lake Huron and those east of it. They were a numerous people and their trade a very desirable one. It is true they claimed sovereign rights over the Ottawa river, but it seems to have been only an empty boast.

There are some maps of old date, upon which this river is named the Ottawa, but it was not then so called by the Indians or whites who lived upon its shores or frequented its waters. By the former it was spoken of, as it is yet in its upper reaches, as Kitchi sibi, and by the latter as the Grand river, a literal translation of the Indian name.

In the days of the voyageurs, owing to dread of the Iroquois who were masters of the upper St. Lawrence, the great trading route between Montreal and the lakes was by way of what we now call the Ottawa and the French rivers, and it is probable that the former, from being originally spoken of as the river of the Ottawas, at last came to be known as the Ottawa river.

Quyon. I have been informed on reliable authority that this river took its name from a game which the squaws were accustomed to play on the flats at its mouth.

This game was of the nature of lacrosse. It was played with pointed poles by aid of which the players threw from one to another two round pebbles sewn up in a loose deerskin pouch. The Indians looked upon it with contempt, as only fit for women, and in derision called it Okweawnwi. In time the French voyageurs replaced this with a word of their own of a somewhat similar sound and meaning, but in doing so lost the flavour of Rabelaisian humour which the original word contained.

Mississippi. This name as applied to the river running into the Ottawa four miles below Arnprior is evidently a mistake. The Indians called the Ottawa Kitchi sibi. Now Mississippi and Kitchi sibi are only different forms of the same word, meaning the big river, and it is manifest that no one would name a comparatively small river and a much greater one into which it ran both "the Big river".

My sister, when searching the Archives in Ottawa for something having no bearing whatever on this question, came across an early Government return in which this river was referred to as the Mississquoi.

From this it appears as if its original name was Mississquoi, "the river of the big woman", and that white men in time changed it into the, to them, better known name Mississippi.

Of course there is always the possibility that it may have been called Mississippi by the natives on its upper waters, but the names by which we know the great majority of Canadian rivers have been derived from some peculiarity of condition which existed at or near their confluence with the greater rivers, and naturally so, for it was by that route in almost every case that they were first reached.

Madawaska. Baraga gives this as derived from Matawashka, meaning the river with hay or rushes it its mouth.

This is certainly not correct as regards the Madawaska which is a tributary of the Ottawa. At its mouth the banks are comparatively high and rocky and the water between them deep. At no time within historic period can there ever have been any growth of rushes there.

Its deriviation is undoubtedly from "Meta or Mata", denoting the forking of a river, and "Auska" the sound of rippling current.

Thus Mata Auska means "the river with a rippling current at its mouth".

BOOK NOTICES AND REVIEWS

IN DEFENCE OF THE CROW.—(A letter in the *Manitoba Free Press*) by Norman Criddle, Treesbank, Man., Nov. 23, 1918. Republished in *The Canadian Forestry Journal*, XIII, Dec., 1918.

This letter is in answer to a denunciation of the crow in a previous issue of the *Free Press*, evidently calling attention to its egg-stealing proclivities in relation to game. Mr. Criddle quite properly calls attention to the fact that the crow for generations lived side by side with other wild life but without evident serious effect upon it until man came in and assisted in turning the scale. He therefore largely aquits the crow with being a serious factor in the disappearance of the wild game which he blames upon over-shooting and disregard of present laws which he regards to be sufficient if enforced to restock our preserves. He incidentally makes complaint of the automobile which certainly is the most serious new destructive agency wild life has had to face since the passing of the flint-lock gun. He calls attention to Bulletin 621, of the U. S. Biological Survey, "The Crow and its Relation to Man" (Supt. Public Documents, Washington, 15 cents), and its findings as to the value of the crow as an inesct destroyer supplementing it with figures of his own stomach examinations.

The crow is economically one of our most perplexing species, its good and evil traits are inextricably intermingled. It certainly does a great amount of harm, but as certainly it also does a large amount of good. It is almost impossible to find out just where we stand in relation to it. The fact that it has cleared the grubs from his neighbour's field does not satisfy him who sees an entire planting of corn destroyed and the number of game bird nests destroyed by the culprit staggers its sincerest apologist. The relation of the crow to agriculture is, however, largely an academic question. The crow is with us to stay and though active war has been waged against it for several generations it increases or remains stationary according to local conditions irrespective of the efforts of man. The general farmer and the sportsman are too convinced of the undesirability of the crow to be readily moved from their belief. As the question does not seem to be serious, the crow being in no danger of extinction, in spite of diatribe against it, it seems the part of wisdom to direct our attention to less questionable subjects where the need is more pressing and our influence promises to be more effective.

P. A. T.

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA.—This society has recently published Numbers 8 and 10, Systematic Series, both of which are of interest not only to students of insect life within the province, but also to entomologists throughout North America. In Number 8 (30 pages), E. H. Blackmore discusses the species of the genus *Pero* which occur in British Columbia, and in addition gives "Further additions to the list of British Columbia Geometridæ; R. C, Treherne tells of the occurrence of *Glutops singularis* in B, C., and Mr. G, O. Day has a paper in "Larva Rearing." In Number 10 (31 pages), W. Downes presents "Notes on the Lepidoptera of the Northern Okanagan; J. W. Cockle discusses larval hibernation and the movement of *Boreus* in snow; E. H. Blackmore, "Notes on Geometridæ new to B. C. (2 plates), and Dr. A. E. Cameron, "Fossil Insects," with special reference to those of the Tertiary lake deposits of the Similkameen valley, B.C. In addition, Mr. Treherne publishes an obituary notice of Tom Wilson who possessed a wide knowledge of natural history, particularly of the province of British Columbia, and whose sad death in a disastrous fire at Coquihalla Hotel, Hope, B.C., on March 16, 1917, was a distinct loss to field-naturalists generally.

A. G.

PROPOSED CHANGES IN THE CONSTITUTION OF THE OTTAWA FIELD-NATURALISTS' CLUB

At a meeting of the Council of the Ottawa Field-Naturalists' Club held on January 15, notices of motion to amend the Club Constitution as follows were given:

ARTICLE III. Membership

(2) Members. Anyone interested in Natural History may upon application, be elected by Council, or by the committee of Council resident in Ottawa and charged with that responsibility, as a member of the club. Payment of the annual fee shall be a necessary condition of the continuance of membership.

(b) Fellows. There shall be elected, from among the Canadian workers in anthropology, botany, entomology, geology, paleontology, ornithology, and zoology, ten charter fellows. To this number shall be added yearly, in the manner outlined below, not less than one nor more than three fellows.

The method of election for the charter fellows shall be as follows. The council, at the first meeting subsequent to the annual meeting on March 18, 1919, shall draw up a list of the fifty members of the club who seem most competent to perform the duties required. To each of these, as well as to each professor, associate professor, and assistant professor of the sciences mentioned in the Provincial Universities of Canada, and in the Universities of McGill, Toronto, Queen's, and Laval (Montreal), shall be sent a request that he draw up a list of the 25 Canadian workers in the sciences mentioned ranking them from 1 to 25 in the order of eminence. These lists shall be enclosed in a sealed blank envelope, and forwarded in a larger endorsed cover to the Secretary. They shall be counted and evaluated by a committee appointed by the Council and announcements of the result shall be made as soon as possible in the Ottawa Naturalist, suitable notification being forwarded to each fellow elect. Subsequent election shall be conducted similarly, except that the number of candidates ranked by each elector shall be 15 instead of twenty-five, and the election shall take place sufficiently prior to the annual meeting in order that the result may be announced at that time.

The law of averages is such that a group of 75 or more lists prepared in the way suggested will enable the club to know that the men selected deserve the honor which will come to them with election as fellows of the club.

ARTICLE V. Officers.

Last word, first paragraph, leave out "Librarian".

ARTICLE VI. The Council

Middle of second line, change "eight" to nine.

ARTICLE VIII. Meetings

Change paragraph "a" to read, (a) The Annual Meeting of the Club shall be held on the first Tuesday in December.

ARTICLE X. Elections

Second paragraph, second last line, leave out "Librarian".

ARTICLE XVII. Duties of the Secretary

Third last line, change "The Ottawa Naturalist" to such other name as shall hereafter be agreed upon in Art. XX.

ARTICLE XX. The Ottawa Naturalist

In first and third last line and heading of article substitute for "Ottawa Naturalist" such other name as may be agreed upon at the next Annual Meeting.

These motions will be introduced and voted on at the Annual Meeting, March 18, 1919.

Members of the club are invited to suggest names which they consider would be suitable for the publication in place of "The Ottawa Naturalist." The proposed change of name was intimated in a previous issue.

The January issue of The Ottawa Naturalist was mailed on March 10, 1919

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THE BIRDS OF SHOAL LAKE, MANITOBA.

By P. A. Taverner.

(Continued from page 144)

46. ***AMERICAN BITTERN,** *Botaurus lentignosus.*

In 1901, Seton found it abundant and breeding. He says: "A conspicuous feature of the landscape—hard at work night and day pumping out the bog". We found it in no such numbers. May 19 to 21, 1917, one was heard each night in a marshy spot behind camp. The next day one was taken but we did not hear the species thereafter. This bird was a male with the skin of the throat greatly thickened with a tough gelatinous tissue inside that I have met with a number of times before in spring males of this species, but have never seen referred to in print nor found ornithologists generally familiar with it. The tissue is very much like that behind the throat puffs of the courting Prairie Chicken and, judging from the dried specimens of breeding spring Pectoral Sandpipers in our collection, probably similar to conditions found in the inflatable sac of that species. As the Bittern inflates its throat while courting or booming it is likely that this deposit is of similar origin in each of these species. It lines the inside of the skin perhaps one-eighth of an inch thick and is soft and rubbery, firmly attached to the skin, and sliding away under the knife in a manner that makes its removal very difficult. In 1918, Young saw occasional birds in May, June and August.

47. **GREAT BLUE HERON,** *Ardea herodias.*

The Ward brothers say that this species was rare on the lakes even in time of high water and extensive marsh. They rarely observed over one or two each year. In 1918, Young reports seeing two birds on July 10 at the Narrows.

48. **BLACK-CROWNED NIGHT HERON,** *Nycticorax nycticorax.*

Reported by Chapman as breeding on the ground in reeds two to three inches above water, the record is accompanied by photographs of nests in "Camps and Cruises". It is said by the Ward brothers to have nested in large colonies on the floating debris where the drift of the lake came in at the edge of the marshes. Only a few migrants have been seen of late years. Seton describes a night herony where "scores, probably hundreds of nests, were in the tall quill-reeds; but none at all to the trees". He quotes a resident farmer, G. H. Meacham, as authority for the statement that three years previous (to 1901) there were but twenty pairs present, but remarks that their rapid increase was marvelous, stating, "No doubt this is one of the species whose number fluctuate with the rise and fall of the lake", thus forcasting their present disappearance again.

49. **WHOOPING CRANE,** *Grus americana.*

We were informed by the Ward brothers that Whooping Cranes used to breed and be fairly plentiful. About 1901 they saw thirty birds together. They have grown much scarcer of late years, but still a few are seen each season. In 1916, three were seen by Frank Ward, and even in 1917, about a week before my return visit, two passed immediately over him flying very low.

50. **SAND-HILL CRANE,** *Grus mexicana* or *canadesis.*

In 1917, we saw no cranes but a nearby farmer had heard them a few days previous to our questioning. We looked for them but found their old haunts dried up and encroached upon by settlers. The Ward brothers say that, until very recently a few still bred on nearby muskegs and in late summer and early autumn they visit the grain fields in large flocks, but are decreasing. A few days previous to my return visit in the autumn, William Ward saw several, but regarded this as a late date. In 1918, a number were observed shortly before Young's arrival, and he noted one April 25. Small flocks of from three to eight were seen later from August 15 to Sept. 6, usually high in the air. The Ward brothers think they recognized two sizes in the cranes commonly seen, which would indicate that both the Sandhill and Little Brown Crane occur; in which case the former would likely be the breeding form, and the latter a migrant.

51. *SORA RAIL. *Porzana carolina.*

During the spring visit of 1917 there were innumerable suitable places for rails and their voices were heard a number of times, but we saw only a single bird on May 30. The Ward brothers are, quite excusably, uncertain in their identifications of the various species and plumages of the rails. They claim to have found nests of three species; and speak of a small black one which is likely the young of the Virginia. In 1918, Young reports Soras rather scarce in spring but becoming very common in August. On Aug. 2 he counted over fifty in one small wet marsh. After that they gradually reduced in number, and the last one seen was on Sept. 20.

52. YELLOW RAIL, *Coturnicops noveboracensis.*

Though this little rail should be common, it is such an accomplished skulker that we saw none. The Ward brothers tell of nests of very small rail eggs, and during my autumn stay in 1917, Frank Ward, while raking hay, uncovered and forced into flight some small rails with large amounts of white on the wing. He was unable to capture any at the time, and though I later watched haying operations in adjoining localities closely, no more were discovered. In the same vicinity while hiding in the grass near a small pond, I heard a repeated bird voice suggesting a rail close by, but was unable to flush the author. I have little doubt but that they were from Yellow Rails but am unable to substantiate my conclusions. Through the summer and autumn of 1918, Mr. Young watched haying operations closely but was unable to detect any Yellow Rails.

53. *AMERICAN COOT, *Fulica americana.*

Chapman, in his "Camp and Cruises", gives photographs of a Coot's nest taken in 1901. Not seen by us in 1917, but in 1918, Young observed small numbers to May 21 and flocks of 100 to 150 the last of September. Said by Seton and the Ward brothers to have been a very common breeder when the water was high and even up to three years ago, in favorable localities, a few still nested.

54. *NORTHERN PHALAROPE, *Lobipes lobatus.*

A few seen in 1917 among the groups of Wilson's Phalaropes between May 23 and 29, perhaps twelve in all. In the autumn three were seen on Sept. 22 and again on the 24. Specimens were taken during both seasons. Regarded by Ward brothers as rather scarce. In 1918, Young noted occasional flocks, beginning with 20 on May 29, culminating in 100 on June 1, and a few remaining until June 12. In autumn he observed small groups from Aug. 20 to the end of the month with a straggling flock on Sept. 21.

55. *WILSON'S PHALAROPE, *Steganopus tricolor.*

During the 1917 spring visit the commonest and most generally distributed wader. Nearly every little slough had a pair or little group, usually females gracefully swimming about, and a nest of fresh eggs was collected on June 6. Young tells of a flight song he saw executed by a female in the presence of her (prospective?) mate. During it she distended her throat in the same manner as the Pectoral Sandpiper is reported to do. The Ward brothers state that they have seen this courtship flight a number of times. At another time a Phalarope was whirligiging in its characteristic manner in shallow water; upon examination the bottom below it was found to be scratched in semicircles as if with the feet. The Phalarope seem to be entirely surface feeding birds, never dipping down into the water for food. Evidently this graceful spinning is a method of stirring up the water and bringing small particles of food to the surface within reach of the delicate, rapier-like bill. The usual note of the species is a miniature quack, like that of a domestic duck but less loud. From this they are locally called "Grunters". None were seen during the return visit in the autumn of the year. Owing to the progressive drying of the marshes. Wilson's Phalarope was not quite as common in 1918, but Young records a few almost daily from May 7 to Aug. 20 when the species disappeared.

56. *WILSON'S SNIPE, *Gallinago delicata.*

Quite common in 1917 and, though no nests were found, evidently breeding. The sound of its aerial dive and love-making flight could be heard each evening, and occasionally throughout the day. A few were still present during the autumn visit in September. In 1918, Young found it rather less numerous from May to August, but very common in September, and to the time of his leaving on Oct. 2.

57. *DOWITCHER, *Macrorhamphus griseus.*

On May 18, 1917, one was dropped from a large flock as it passed the tent and another was taken on May 30. In 1918, Young saw small bunches on May 22, 25 and 28, and Aug. 9. Of six adult spring specimens but one can be particularly referred by bill size to *M. g. griseus* and two to *M. g. scolopaceus*, the remainder falling into the overlapping measurements of the two forms as given by Howe, (*Auk*, 1901, pp. 157-162). In coloration the birds seem to agree most closely from descriptions with *scolopaceus* but without direct comparison with birds of eastern origin I would hardly like to make a definite determination; on geographical grounds they should be referred to *M. g. scolopaceus.*

58. *STILT SANDPIPER, *Micropalma himantopus.*

In 1917, a flock of twelve were noted wading "knee deep" in the shallows of the Narrows on May

25, and on May 28 twenty-five more were observed in the same place. In 1918, Young observed eight on May 25 and 28. They returned again on Aug. 26, and from four to six were seen to the end of the month. The Wards regard them as common migrants.

59. *PECTORAL SANDPIPER, *Pisobia maculata.*

On May 25, 1917, a small flock of eleven waders that we took to be of this species were seen. On June 2 a single individual was taken. Young did not see the species in the spring of 1918, but on Aug. 24 ten birds appeared and he noted them almost daily, in numbers fluctuating between four and fifty, to the end of September. Only one of these, taken Aug. 27, is adult.

60. *WHITE-RUMPED SANDPIPER, *Pisobia fuscicollis.*

In 1917 a single individual was seen on May 29 in company with a flock of Least Sandpipers, but it was very common on June 2 with large mixed flocks of Least and Semipalmated Sandpipers and Plover. In 1918, Young observed them almost daily from May 22 to June 12, and a later group of four on June 20. On Aug. 7 ten returned and remained in approximately constant numbers until Sept. 12.

61. *BAIRD'S SANDPIPER, *Pisobia bairdi.*

Not recognized in 1917. Amongst the small waders collected by Young in 1918 are individuals taken on Aug. 8 and 9 from companies of White-rumped Sandpipers.

62. *LEAST SANDPIPER, *Pisobia minutilla.*

In 1917, very common until June 6, when it departed with the majority of the other waders. During the September visit, I saw a number of small sandpipers with Semipalmated Sandpipers and Plover that I took to be Leasts, though the presence of more important material near by prevented shooting them for absolute verification. In 1918, Young reports the first Least Sandpiper on May 16, becoming common on the 28th, and remaining so until June 12. Individuals were seen June 20 and July 27, but the species did not return until Aug. 22, remaining until Sept. 7.

63. *RED-BACKED SANDPIPER, *Pelidna alpina.*

Common in the spring of 1917. First noted on May 25. Most abundant on the 28th; they disappeared with most of the other migrant waders on June 5. In 1918, observed from May 22 to June 1 in limited numbers; not noted in the autumn of either years.

64. *SEMIPALMATED SANDPIPER, *Ereunetes pussillus.*

In 1917, we did not note this species definitely amongst the flocks of mixed small sandpipers until May 25 when they were selected from a bunch of Leasts and collected. On June 2 the flocks were composed almost entirely of this species and three solitary individuals were seen after June 5. A few were seen and collected during the autumn visit Sept. 22. In 1918, Young reported them between May 19 and 29, and again in the autumn from Aug. 23 to Sept. 10.

65. *SANDERLING, *Calidris leucophaea.*

In 1917, common in the mixed flocks of small waders from May 28 to June 5 when most of the migrant shore birds left. In the fall several were seen on Sept. 24. In 1918, seen by Young from May 19 to June 12 and again from Aug. 8 to 31.

66. MARBLED GODWIT, *Limosa fedoa.*

Though the Wards recognize two Godwits occurring at Shoal Lake, we were unable to positively identify the Marbled, though several flocks observed the day of our arrival, in 1917, we tentatively ascribed to this species. The Wards do not know of either species breeding.

67. *HUDSONIAN GODWIT, *Limosa haemastica.*

One of the surprises of the 1917 trip was the rediscovery of this fast disappearing species. On May 18, Young took one male from a flock of five and the day after I saw a bird that I was satisfied was of the same species. In 1918, Young saw flocks of 12 and 15, on May 21 and 25, and a single bird on the 29th. On July 31, five more were noted passing over towards Lake Manitoba. Of the specimens taken, two females have considerably more white and grayish feather edgings below than the males and a third shows this sexual (?) character less distinctly. The Ward brothers say that the Hudsonian is the commoner of the two Godwits and that it is more easily approached and shot. The fact is they call this the "Foolish Godwit" and say it can be repeatedly approached after having been fired at. This is quite similar to an experience I had with a bird of the same species at Point Pelee, Ont., in 1915, when I stalked and secured a specimen after having once missed it. In seeking for a cause for the rapid decrease of the species this unwariness should be considered as a factor. It may be that similar habits will also explain the unexpected disappearance of other species. (See *antea*, Trumpeter Swan.)

68. *GREATER YELLOW-LEGS, *Totanus melanoleucus.*

But single birds identified May 27 and 30 in 1917. In 1918, Young found it present in small numbers in a ratio of about one to ten, as compared with the Lesser Yellow Legs, from April 24 to May 15, leaving about two weeks before the latter. In the autumn but casual singles were seen between Aug. 21 and Sept. 12. Said to have been the commoner of the two Yellow-legs when the lake was high but now much less numerous and growing scarcer.

69. *LESSER YELLOW-LEGS, *Totanus flavipes.*

In 1917 common from the time of our arrival on May 17 to June 5 when most of the migrant waders left. One was taken Sept. 21 on the shore of a small pond some distance from the lake. In 1918, the species was common from April 25 to May 28, and abundant from May 5 to 15. In the autumn stray individuals appeared July 13 to 20, but the bulk did not arrive until Aug. 4, culminating in numbers on the 19th, and remaining until Sept. 7.

70. *SOLITARY SANDPIPER, *Helodromas solitarius.*

In 1917 but single specimens occasionally seen during our spring visit and one noted Sept. 17. In 1918 small numbers were seen regularly between May 8 and 27, and Aug. 5 and Sept. 18.

71. *WILLET, *Catoptrophorus semipalmatus.*

In 1917 one bird was observed from the train between Winnipeg and Erinview, but the species was not noted on the lake. In 1918, Young took single individuals, the only ones noted on the lake, on May 29 and Aug. 10. The spring adult of these two is so decidedly grayer than a Sapelos Island, Ga., bird and both agree so perfectly with comparable material from Saskatchewan and Alberta, that I have little hesitation in referring them both to the Western Willet, *C. s. inornatus.*

72. *UPLAND PLOVER, *Bartramia longicauda.*

Said by Seton to have been "somewhat common" in 1901, "but nearer Winnipeg, where the prairies were drier, it became more abundant". Evidently the drying of the prairie has allowed it to increase its range considerably for we found it a very common bird in 1917, and the Ward brothers say it is increasing. One could hardly go five minutes in any direction from camp without coming across one or more pairs, while its long-drawn whistle was one of the most characteristic and beautiful of the prairie sounds. On the ground the Upland Plover has a very un-wader-like appearance looking more like a long-legged grouse chick, but immediately it takes flight the long sweeping wing strokes proclaim its true relationship. It breeds commonly about the lake, but its eggs, surprisingly large for the size of the parent, are very difficult to find. The parents are very solicitous for the safety of their nests and show great ingenuity in diverting the attention of the intruder. It was not present on my return visit in September. In 1918 it put in an appearance on May 7 and remained common until the middle of August, the last one being seen on Aug. 28. Mr. Young informs me that he looked very carefully for juveniles through the summer but without success. Adults were in common evidence the entire season but even the mowing-machines of the hay-makers failed to discover young or partially grown individuals. How so large and prominent a bird can be raised to maturity without observation is problematical.

73. *BUFF BREASTED SANDPIPER, *Tyngites subruficollis.*

Young met single individuals of this rare species on Aug. 9 and 31, collecting the latter one. The growing scarcity of this species is a matter of some anxiety to those who view with alarm the general decrease in our shore birds.

74. *SPOTTED SANDPIPER, *Actitis maculata.*

This unusually common species was unaccountably scarce on the lake shore in 1917 where conditions seemed ideal for it. We only saw occasional individuals and some days along the lake shore we would fail to see a single bird. In 1918 the species seemed slightly more numerous but still far from common and the greatest number noted any one day was 8 on Aug. 21. It was not noted in spring until May 18 and the last one was seen on Sept. 21.

75. LONG-BILLED CURLEW, *Numenius americanus.*

In 1917 we saw birds in the distance several times that we took to be Curlew. Young did not observe it in 1918. The Ward brothers know of but one species. I include them under this species hypothetically.

76. *BLACK-BELLIED PLOVER, *Squatarola squatarola.*

In 1917 seen from May 26 to June 1, and again on Sept. 22 and 24. Said to be more common in autumn than in spring and to stay very late. In 1918, Young noted small flocks numbering from 3 to 15 on May 22 to June 3. A single individual was seen on June 20. In the autumn similar numbers were seen from Aug. 8 to Sept. 23.

77. *GOLDEN PLOVER, *Charadrius dominicus.*

In 1917 one seen on May 22 and another on the 26th. In the autumn one specimen was taken on Sept. 22. In 1918, four and three were noted May 30 and June 4 and 6 and one on Aug. 21 and on Sept. 21.

78. *KILLDEER, *Aegialitis vocifera.*

Very common and breeding everywhere. One could hardly get out of hearing of its querulous complaining. In the autumn several were seen in 1917 and until Sept. 19, 1918.

79. *SEMIPALMATED PLOVER, *Aegialitis semipalmata.*

First seen in 1917 on May 19, common on the 28th; none observed after June 5. Present in 1918 from May 20 to June 12, and from Aug. 1 to 31, with a single straggler Sept. 14.

80. *PIPING PLOVER, *Aegialitis meloda.*

One or two pairs were usually to be seen on the flats near the Narrows, where they associated with flocks of Semipalmated Plover and other small waders. Without doubt they breed though we discovered no nests. In 1918 the Piping Plover was present in small but constant numbers continuously from May 15 to Aug. 30, and a single individual noted on Sept. 7.

81. *TURNSTONE, *Arenaria interpres.*

Five seen in 1917, May 25 and 30, and six on June 3; none thereafter. In 1918, the species arrived in large numbers (500) May 28, gradually reducing to 2 on June 12. In the autumn a few individuals were noted on Aug. 7 to 27.

82. *RUFFED GROUSE, *Bonasa umbellus.*

A few Ruffed Grouse still hold out in some of the larger bluffs. Their far carrying drumming was often heard and three specimens taken in 1917. According to Ward brothers, they were once very numerous indeed, but are getting very scarce. They do not seem to have learned the wariness that our eastern birds find necessary to existence, and still allow themselves to be treed by the dogs or shot on the ground in truly primitive manner. This and the unusual number of Goshawks and Horned Owls that invaded the country in the winter of 1916-17 are probably the causes of the great decrease in numbers. Though the Gray Ruffed Grouse, *B. u. umbelloides*, that inhabits the prairies is not a very well marked or stable race these are quite typical of that form. 1918 did not show much improvement in the Ruffed Grouse situation and no increase was apparent. One specimen taken is slightly more red than those of previous years, but we obtained none of the large red phase that Seton mentions as occurring in Manitoba and of which the Wards seem cognizant.

83. PTARMIGAN, *Lagopus (lagopus?)*

The Ward brothers say that they know of five Ptarmigan being killed within a few miles of our camp—always in winter of course. If the Ptarmigan ever occur here they are in all probability Willow Ptarmigan, *L. logopus.*

84. *PRAIRIE CHICKEN, *Tympanuchus americanus.*

The Ward brothers say that this species appeared commonly in the Shoal Lake country some 13 to 15 years ago, though Arnold records nests in 1894 at the south end of the lake and Seton saw one in 1901. They increased to great numbers, but the last few years have died out together with the other grouse both Sharp-tailed and Ruffed. Of this I have more to say under the following species. Throughout the Canadian west the name of this species has been given to the Sharp-tailed Grouse and wherever the term Prairie Chicken is popularly used it is that species that is meant. However, correctly speaking, this is the true Prairie Chicken and has a prior right to the name. Taking into consideration the confusion that has arisen between these two species it might be advisable to apply "Prairie Chicken" to either species of Prairie Grouse indiscriminately and revive the equally satisfactory name Pinnated Grouse for this species. About Shoal Lake the true Prairie Chicken is called "Square-tail" or simply "Grouse". Unlike most of its family this species is partially migratory and most of them disappear from the northern sections of their habitat in winter. The Wards tell about a tame Prairie Chicken they had for several years that returned regularly each spring and was as much at home about the place as a dog or a cat and quite able to protect itself against these natural enemies. Once, during migration, it was noted in the outskirts of Winnipeg where its tameness attracted interested attention, and a newspaper paragraph, while its identity was substantiated by its lack of a toe.

We saw very few scattered individuals during the spring visit of 1917, though their dull booming while love-making could be heard at all hours of the day. This sound has a peculiar intensity and wonderful carrying power and is as easily heard a mile away as just across a field. The constant reoccurrence of this sound in our ears, therefore, was not an indication of large numbers of the species, but of the great extent of the country within auditory range. We probably heard the same individuals again and again. The birds were very wild indeed flushing at a great distance from the intruder and flying a mile or more before alighting. In the autumn I found them considerably more common probably owing to the successful raising of a few broods. Contrary to expectations, Young found the species even less common in 1918 than the previous year. Probably the fall shooting was more than their reduced numbers could stand. A close season of some years on this bird seems expedient to bring them back to their normal numbers.

85. *SHARP-TAILED GROUSE, *Pedioecetes phasianellus.*

This is the original prairie grouse of the Canadian plains. It has been gradually displaced in southern Manitoba by the true Prairie Chicken or Pinnated Grouse of further south. Though generally called "Prairie Chicken' it has no title to that name having a perfectly good and distinctive one of its own as above. About Shoal Lake, we found it even scarcer in 1917, than the real Prairie Chicken which seems now to be the most characteristic game bird of the locality. During the spring visit we saw but two birds and inquiry amongst the farmers elicited reports of but a few more individuals. In the autumn none were seen. In 1918, Young found it still scarcer than the previous year only noting it once at Shoal Lake on Sept. 21, though a flock of

20 were seen on Sept. 29 at Lake Francis at the south-east end of Lake Manitoba when it seems that the species enjoys better conditions. Though undoubtedly overshooting has had a powerful influence in the depletion of the grouse of the prairie provinces it was probably not the whole cause. Throughout the provinces of Manitoba, Alberta and British Columbia we heard practically the same report in 1917. A great abundance of grouse of all kinds followed by sudden disappearance. Coincident with this were unusual numbers of Goshawks and Horned Owls through the late fall and winter of 1916-17 and the failure of the rabbits of all kinds both locally and throughout the north. The connection between all this is obvious. The regularly re-occurring dying of the rabbits through the well known rabbit disease deprived the large raptorial birds of their usual food supply, and they were forced to come into more southern sections and turn their attention to the only food to be found there, the grouse, with the result that the latter were practically cleaned out. The story is remarkably consistent wherever we obtained first-hand evidence, and applied as well to the lonely reaches of the Red Deer river valley, the preserved areas of Dominion Parks, where shooters rarely or never penetrated, as to sections adjacent to dense settlement where the sportsmen would be a most important factor. When limited to animal or steam locomotion the radius of action of the shooter is comparatively small and in the vast extent of the western provinces there remain large expanses where the birds can live practically undisturbed. By use of the automobile, however, there is little chance of retaining sanctity for any purely natural reservation. However, it cannot be doubted that this particular and present low ebb in upland game life is due more to natural causes than to man. Caution must be used in advocating the destruction of large hawks for it is only a few winter species that can be unhesitatingly condemned. The summer hawks do little if any damage[†] and will be discussed under their proper headings.

86. *MOURNING DOVE, *Zenaidura macroura*.

Not uncommon, they were seen in small numbers on every visit and as late as Sept. 28, in 1918.

87. *MARSH HAWK, *Circus hudsonius*.

This is the commonest hawk of the locality and it was seldom that one or more were not in sight. They seemed to have well defined beats over which they worked regularly at stated times of the day. There were several nests in the vicinity of our camp, one of which was found, though later broken up by some animal of prey of considerable size, as there was evidence of a severe struggle about the nest. A very pretty sight was witnessed several times. One hawk, usually the male, with a mouse or other prey in its talons approached the nesting marsh calling loudly. It was answered by its mate who rose from the nest and came to the call. They circled and manœuvred a minute and then, as the female passed beneath her mate, he dropped what he held and she with a quick reach of her talon, caught it in the air and returned to the nest or an adjoining knoll to feed it to the young or to herself. Sometimes several attempts would be made by the two birds to get into the proper relative position, but the upper bird never dropped the prey until he was satisfied that conditions were favorable nor, when he did drop it, did we ever see his mate miss the catch. Marsh Hawks were still common when I returned in the autumn of 1917 and when Young left in early October, 1918.

88. *SHARP-SHINNED HAWK, *Accipiter velox*.

In 1917, one bird seen on May 25th and other individuals on various days during the September visit. In 1918, Young noted occasional individuals throughout the summer except from June 2, to Aug. 5.

89. GOSHAWK, *Astur atricapillus*.

Though no Goshawks were seen in 1917, Young noted two on Aug. 21, 1918. We received such detailed accounts of the number of "large gray hawks" that visited the country the winter of 1916-17 that there could be little doubt as to the identity. Without question these birds together with Horned and Snowy Owls, were the immediate cause of the scarcity of Prairie Chicken, and Sharp-tailed and Ruffed Grouse. This bird is a brush hunter and doubtless accounted for many Ruffed and Sharp-tailed Grouse in the poplar bluffs by day, while the Horned Owls took many by night that roosted in insufficient cover whilst the Snowy Owl that is largely a diurnal hunter scoured the more open places. The trio made a combination that is difficult for any grouse to escape. As mentioned before, doubtless these birds came from the north in such unusual numbers in search of food on the depletion of their usual rabbit supplies. To date, February, 1919, we have received no notification of another flight of these birds. On the contrary all reports point towards an increase of rabbits, and a decrease of destructive raptorial birds in the more settled communities, and we assume that it will be several years before the latter become a serious menace again.

90. *RED-TAILED HAWK, *Buteo borealis*.

Next to the Marsh Hawk this was the hawk most often seen. They were shy, though still not quite as wary as the individuals we are in the habit of meeting in the eastern provinces. They nest in some of the smallest trees, and those accustomed to finding Red-tail nests in the tops of the highest and most inaccessible trees, are surprised at the low elevations of many of their nests; we found them as low as twelve feet from the ground. A few birds seen were very dark or entirely black, though the six taken in 1917 were of ordinary light type and four of them indistinguishable from eastern birds; only two would have been identified as Western Red-tails, *B. b. calurus*, if their geographical origin were unknown. Probably some of the birds seen were Swainson's Hawk but except in most typical plumage I fail to see how these species can with certainty be separated in life. While it is evident that the Goshawk and the two large owls do serious damage to upland game, little objection can be made to these large summer Buteos. Through the spring and summer their main dependence is upon the Gophers and Ground Squirrels and the good they do in this direction can hardly be over-estimated. Though we were not in the Shoal Lake district during the summer we had special opportunities of studying the economic effect of these birds on the Red Deer River in Alberta a few weeks later, where the conditions as far as this aspect of the question is concerned are similar. We found them subsisting exclusively upon small destructive mammals. If it is true, as most excellent judges have stated and as was verified to us by several practical farmers, that a gopher will destroy a bushel of wheat in a season, with this grain worth two dollars a bushel, the hawk that takes a gopher a day for three months in the year is of real economic value to the community and should be rigidly protected. It is true that gophers hole up early in the autumn, after which the Red-tails and other Buteos may turn their attention to other food supplies, but only after several months of valuable service to man. These birds are peculiarly mammal-eaters and usually turn to mice rather than to birds. A few individuals occasionally, under certain conditions, develop a taste for poultry and game, but it is comparatively rare for they have not the speed and energy to hunt such game systematically as does the Goshawk or the rare large falcons. However, it would take a great number of chickens and game to counterbalance the good done by the destruction of noxious rodents, especially in the prairie provinces where these pests are a serious hindrance to agriculture. The farmer and other shooters usually plead their inability to separate one hawk from another as extenuation for killing all birds of prey. In truth, when the stake is so important, a modern agriculturist has as little excuse for not learning to discriminate between bird friend and foe, as he has for failing to learn the obnoxious weeds or insects and the methods for their control. Many, also, fail to judge the relative proportions of the case; they are loud with indignation when a hawk takes a partially grown chick, but fail to enthuse when the same bird prevents the destruction of twenty bushels of grain. While an occasional Goshawk does or may remain in settled communities through the summer the majority of the large summer hawks are Buteos and harmless. They depart in the autumn while the objectional ones are mostly winter visitors. Should only winter hawks be killed or such others as are caught in the guilty act, but little mistake will be made.

[†] See Hawks of the Canadian Prairie Provinces, by P. A. Taverner, Mus. Bull. No. 28, Geological Survey, Dept. of Mines, Ottawa, Aug., 1918.

91. *SWAINSON'S HAWK, *Buteo swainsoni.*

Though we failed to identify this species specifically in 1917, Young took a specimen on May 23, 1918. It is quite similar in color to the ordinary juvenile Red-tail, but more profusely and evenly spotted over with dark on all below except throat.

92. *BROAD-WINGED HAWK, *Buteo playpterus.*

Mr. E. Arnold tells me that he took a set of Broad-winged Hawk's eggs near Woodlands a few miles south of Shoal Lake, June 10 (1895). On May 5, 1918, Young reports flocks of 5 to 10, aggregating 50 or more, passing over every twenty minutes or so, all headed north. Single individuals were noted on the 8th and 22nd, and then no more were observed until Oct. 1 and 2, when three and two were seen.

93. *ROUGH-LEGGED HAWK, *Archibuteo sancti-johannis.*

Mr. Wm. Ward presented us with a specimen he killed on Oct. 2, 1917, which forms our only record for the locality. These large hawks, characterized by having the legs feathered to the base of the toes, are probably the least harmful and most beneficial to man of all the raptores.

94. BALD EAGLE, *Haliaetus leucocephalus.*

The Ward brothers told us in 1917 that four years previously a juvenile was taken. They usually see from three to four eagles a year.

95. PEREGRINE FALCON, *Falco peregrinus.*

In 1918, Young reports the Duck Hawk *F. p. anatum*, several times in May and again on Aug. 2. The Ward brothers seem to know it and report it regular but not common. It is unlikely that it breeds in the locality.

96. PIGEON HAWK, *Falco columbarius.*

Young records the Pigeon Hawk as seen once in early July, several times in late August, and again in September and early October. No specimens were taken but, without doubt, the form is the typical race, *F. c. columbarius.*

97. *SPARROW HAWK, *Falco sparverius.*

Only occasionally seen in the spring of 1917 and not noted in the autumn, but in 1918 a few individuals noted constantly from arrival April 23 to departure the first of October.

98. OSPREY, *Pandion haliaetus.*

One flew directly over our camp on May 26, 1917. Noted in 1918 by Young, from May 5 to Aug. 6. Said by the Ward brothers to be rare.

99. LONG-EARED OWL, *Asio wilsonianus.*

In 1917 we received descriptions evidently referring to this species and were shown an old nest that seemed corroborative evidence. The supposition is confirmed by Mr. Job who reports finding four young of various sizes in an old crow's nest on opposite side of the lake June 28, 1912.

100. *SHORT-EARED OWL, *Asio flammeus.*

The commonest owl in 1917, seen nearly every evening, and often during the day, beating along the lake shore or over the old reed beds and marshes. In 1918, however, Young only noted single individuals three times during the entire season, April 30 to May 15, taking one on May 2.

101. *GREAT HORNED OWL, *Bubo virginianus.*

In 1917 occasional large owls were glimpsed or heard of during the spring visit and on Sept. 17th one was taken. It is referable to the Arctic Horned Owl, *B. v. subarcticus*, but not absolutely typical and with slight tendencies towards the Western Horned Owl, *B. v. pallescens.* During the winter of 1916-17 a large flight of these birds, together with Goshawk and Snowy Owls, came from the north, obviously driven into new fields by the dearth of rabbits. Without doubt the Horned Owls had an appreciable influence in the destruction of upland game; though, as a night hunter, it was probably the least harmful of the trio. Young only noted one individual in 1918, on July 21; by its dates a probable breeder.

102. *SNOWY OWL, *Nyctea nyctea.*

From the accounts of the Ward brothers, it is evident that unusual numbers of this species accompanied the flight of Goshawks and Great Horned Owls in the winter of 1916-17. Being more of a diurnal and open country hunter than the Horned Owl probably this species was largely instrumental in the destruction of the grouse. In 1918, Young saw individuals from April 30 to May 15, taking one on May 2.

(To be continued)

THE ARCHAEOLOGICAL VALUE OF PREHISTORIC HUMAN BONES

BY HARLAN I. SMITH, MUSEUM OF THE GEOLOGICAL SURVEY,
OTTAWA, CANADA.

Why do we bring so many human bones into a museum? Why is one skeleton not enough? Such questions are always surprising for it would seem that anyone might think of many reasons why we should collect the bones and why one skeleton would be as unrepresentative as one man is unrepresentative of his race. If we were to describe a tall, bearded man and say that he is representative of the English, it would be untrue, for there are short Englishmen and there are beardless Englishmen. These features of Englishmen are only two of a great many that could be mentioned. Likewise it is necessary, if we are to know an ancient people, to have enough skeletons to enable us to obtain average measurements and a representative series for study of the type.

The age at which an individual died can be determined approximately from his bones. If we have enough skeletons, we can determine how many individuals died in infancy, how many as little children, how many in middle age, and how many lived to be very old. This information regarding a primitive or savage people would be interesting in comparison with the same facts regarding our own people. We are often told that Indians were very healthy and lived to an old age, but in archæological explorations we find the bones of a great many children and young people as well as those of old people, showing that many of the Indians died young.

Fairy tales about the bones of giants and dwarfs are common. One can hardly think of a place he has explored where he has not been told of the finding of the bones of a giant, yet giants are very rare and of all the hundreds of skeletons that I have dug up and of the thousands seen in museums, I have yet to find so large a specimen. In fact, the skeletons are no larger than those of the people with whom we daily mingle.

The bones of children, easily determined, are often mistaken, by those who know nothing of such subjects, for bones of dwarfs.

A human skull that would hold "at least a peck" figures frequently among stories told by people who have probably never dug up a single skeleton, but who tell of what they have seen someone else find. Where all these extraordinarily large skulls are now is a mystery, for certainly they are not to be seen in our excavations, or in museums. The same is true in regard to the story of the leg bone of a man, told at practically every place in North America where I have carried on explorations. One end of the bone was put on the ground and the other end came nearly to the waist; but such bones are never seen by scientists and have never been produced by the story tellers. Another story that seems to crop up everywhere is of the finding of an immense human jaw so large that it could be placed over the lower jaw of a large man. Practically any v-shaped object can be placed over another v-shaped object, so that any medium-sized human jaw can be placed over the face of any man, but the huge human jaw of the story is never in evidence.

Fine teeth are often attributed to the Indians, and it is stated that savages never suffered from toothache, but in every large collection of Indian bones we are able to observe that they not only sometimes had abnormal teeth, but that they suffered much from toothache and even from large and painful ulcers in the jaws. The teeth of Algonkins are found to have been affected by decay much less than the teeth of Iroquoians who, being agricultural, ate much soft cooked corn food.

Diseased bones are found in large numbers in Indian burial places, many of them among the bones of fairly young people. These show that the Indians were not all healthy. Many diseases do not affect the bones, so that there was evidently a still greater percentage of disease. In a series of only twenty-four skeletons found near Prescott, Ontario, at least three had diseased growths on the spinal column, one so severe that two of the vertebrae were grown together. In the same collection were other diseased bones. When one has a sufficiently large series, say one hundred skeletons, he is usually able to tell what proportion of the people had severe diseases that affected the bones, the various parts of the body that were affected, and the frequency in each part, also whether the bones of an individual were thus affected only in one part or in many. Sores also sometimes leave their traces on the bones to a certain extent. Where the number of skeletons collected is sufficient, statistical studies of all these diseased bones may be made.

Wounds in some cases are indicated by the bones. In a large series from an aboriginal burial place one frequently finds bones that were broken when the individual was alive, which afterward grew together, sometimes as strong and useful as before. Occasionally arrow points are found in bones. Sometimes such a point has been broken off in the bone and healthy bone has grown partly over it, showing that the individual recovered. Frequently these are only found when washing the bones in the laboratory, not having been seen by the excavator because of the soil on the bones. In such cases the facts would never have been known had some particular bone or piece of bone been discarded and reburied.

The uses to which human bones were put and the things done with the body or the skeleton may also be learned from the bones. Disks cut from human skulls and perforated for use as ornaments or charms are found in Ontario. Several lower arm bones have been found in an Iroquoian site at Roebuck in eastern Ontario, which show that one end has been used as a handle while the other has been sharpened for use as an awl or a dagger. Perhaps they were considered to have special virtue because made from human bones or possibly they were for use in practising witchcraft.

Cannibalism may at least be surmised when cracked or burned human bones are found, and cremation where burned bones are found. Scalping is frequently indicated as having been practised in a certain place and at a particular time, by knife-marks found on the bones of the head.

Painting of the bones or body is often indicated by the paint found on the bones. Copper ornaments or implements placed with the dead, even where the metal has completely decayed, often leave a green stain and chemical evidence on bones.

Skulls perforated with conical drilled holes after death or so as to cause death are found in Ontario and suggest that the skulls were suspended as trophies or charms, or had something fastened to them as a death dressing.

The skeleton of a man differs from that of a woman in many respects. If in each of these respects the difference is extreme, it is easy to determine whether the skeleton is that of a man or woman, but if the difference is very slight, or if in one respect the skeleton resembles that of a man and in another that of a woman, it is more difficult to make the determination. For instance, the skeleton of an athletic, outdoor woman in some respects might resemble the skeleton of a man, while the skeleton of a delicate man might resemble the skeleton of a woman. Nevertheless, by careful examination and allowing for error, it is possible to determine approximately the distribution of sex in a series of skeletons and to use this information in many other studies, as for instance to determine whether certain bone diseases were more prevalent among men than among women; and it is possible to compare certain physical features of the skeletons of primitive women with those of our own women who have long been subject to the conditions peculiar to "civilization".

Sutures in the skulls of some old people which have been found had grown almost if not entirely together, so that there was no further opportunity for the brain to increase in size.

The value of large collections of human bones is illustrated by the fact that a dentist living in

Kansas finds it worth while to make a yearly trip to New York to study just the teeth of skeletons received since his last visit in only one museum in that city. This knowledge he uses to advance methods of dentistry, to save not only the teeth of his own patients, but also those of any one going to dentists who derive benefit from his publications. A surgeon visited the same museum and many others solely to measure and study the three large pelvic bones of the female skeletons. This opportunity he expected would result in the saving of many lives. What he learned might be used by many other surgeons who would read of his discoveries. From these facts it is evident that all human bones should be saved during archæological excavations—not merely entire skeletons or only whole bones, but even a stray tooth, a bone of the pelvis, or the broken end of a bone perhaps exhibiting a diseased surface, an imbedded arrowpoint, or a fracture. The humblest bone or fragment may help to increase human knowledge, which in turn may relieve suffering or be useful to mankind in some other way.

It is very desirable that all finds of prehistoric human bones made in Canada be promptly and fully reported to the Museum of the Geological Survey, Ottawa, and the bones, instead of being neglected or reburied, be kept as found until they can be investigated by an officer of the Museum or, where this is impossible, that they be carefully labelled, packed and sent to the Museum.

NOTES ON MIDWINTER LIFE IN THE FAR NORTH.

By E. J. Whittaker.

During the summer of 1917, the writer spent some days at Hay River post, N. W. Territories. This post is pleasantly situated at the mouth of the river of the same name, which flows into Great Slave lake at its western end. While there, we enjoyed the bounteous hospitality of all. We were especially well treated by the English Church mission, the Rev. Mr. Browring, its pastor, and by M. Louis Roy, the trader of the Hudson Bay Company. While awaiting a steamer at the end of the season's work, our stay there was especially pleasant. Fish of all kinds were abundant, and so were potatoes and other garden truck from the mission garden. Such is the rapidity of growth in these northern latitudes where the sun was above the horizon for twenty hours out of the twenty-four, that potatoes planted only forty-five days before were quite large. The brilliant green meadows of the alluvial islands contrasted pleasantly with the sombre hues of the evergreen forest farther back, out of whose depths flowed the brown flashing waters of the Hay, which not so many hours before had flung themselves in a wild torrent over the Alexandria Falls, some fifty miles up the river. This summer aspect contrasts sharply with that of winter, as is indicated in the following paragraphs taken from letters describing the vicissitudes, as well as the pleasures, of life in midwinter in the same region.

In a letter from Mr. Roy, the company trader, the following appears: "We have been very short of goods this winter, and I have been obliged to haul from other posts, and my poor dogs have had no rest at all. I, myself, made three trips, one each to Buffalo lake, Resolution, and Providence. It was terribly cold on that trip to Providence, 65 below, and a head wind. We were unable to use our knives and forks, as they would stick to our lips, and the first occasion we tried it we had a bad time. We would have to put our fingers close to the fire every little while to keep them from freezing. We certainly ate in a hurry then. In the middle of the night, we had to get up to put wood on the fire, as the cold was so intense that the warmest sleeping bag would not keep it out. We would hitch up and '*marche*' at four o'clock. We have had a terribly cold winter and lots of snow. The cold is so intense, and storms so frequent, that the Indians do not visit their traps very often, and there is scarcely any fur being caught. It is the poorest year for fur I have ever seen. They say that east of the Slave river the Indians are living in plenty as the caribou have come closer and in greater numbers this winter than for years past."

Mr. Bowring, according to his letter has been enjoying at his mission a few of the luxuries of a more southerly clime, but has had his troubles too. In his letter, he says: "Lately we have been living quite high. The mission garden gave us a plentiful supply, and we are enjoying lots of beets, carrots, cabbages and onions—not too bad for this out-of-the-way spot. We are getting lots of fish, both trout and whitefish, but the former are very large and almost too fat. I have some parsley growing in the cellar, also some rhubarb. When we run short of provisions, parsley sauce is not bad with whitefish. We are all well now, though most of the workers were down with diphtheretic sore throat, and all had a period of quarantine. Fortunately, it did not get to the village.

"I had the pleasure (?) of a trip with dogs to Chipewayan and back. I do not mind going behind the dogs as a rule, but to get up one morning, as I did, and find that the dogs had swallowed the grub pile, is no joke. The only thing one can do till he gets to the next Indian house is to 'tighten his belt.' I am now resting up after that trip. I was to go down to Fort Simpson, but there was no food there for the dogs, so I had to give it up. There is no fish for the dogs down the Mackenzie, as many of the nets were lost."

It may be said that the trip from Hay river to Fort Chipewayan is considerably over three hundred miles with but two posts en route, Forts Resolution and Smith. So that the loss of one's provisions in the terrible cold of last winter, would be indeed, as Mr. Bowring puts it, "no joke".

In a letter to Dr. Kindle, dated April 26, 1918, Inspector Anderson, of the Royal North-West Mounted Police, at Fort Smith, tells of a patrol which he made from the latter place to Fort Simpson. He says: "I had a very hard trip on account of the very cold and stormy weather and the unusual depth of snow. I escaped with a few frostbites, a common occurrence in this country. It is not such a picnic travelling in winter time here. I have had some tough trips in my time in the police force, but this last one takes the cake. Snow has been very deep and over 60° below zero on my patrol. I camped at Jackfish Point at the outlet of Great Slave lake without enough wood to keep the fire going all night we had to let it go out; no tent, no stove; it was what you may call cold.

"The caribou have moved away from here. One thousand head in a bunch were seen crossing Great Slave lake in March, going toward the Barren Grounds, all females. The males will follow later. Male stragglers only are left near here, about three or four days out (*i.e.*, days' journey from Fort Smith). If it had not been for the caribou considerable hardship would have been experienced among the natives. The snow is gradually going away, and we look to the opening of Slave river about the fifteenth of May."

At the approach of spring, there comes an interval, when the ice is breaking up, and the snow is melting, when travel either by winter sledging or summer canoeing becomes impossible. This period varies in different places. As noted above, Slave river breaks up about the middle of May. In 1917, there was considerable ice in Great Slave lake on June 28th, preventing the supply boats of the trading companies from proceeding beyond Fort Resolution, but by July 1, none was to be seen. The ice on that portion of the Mackenzie above Fort Simpson breaks up about the beginning of June, but below that point, assisted by the earlier break up of the Liard, the river commences to clear about the middle of May. Farther down the Mackenzie, its tributary, Great Bear river, opens about the first week in June. Great Bear lake however, the other great lake of the north, is not free of ice until the middle of July, according to a memorandum received by Dr. Kindle from Inspector Anderson. The difference in latitude is amply reflected in the dates of opening of Great Bear and Great Slave lakes.

In the winter of 1917-1918 we in Ottawa complained of the bitterly cold weather experienced, though the maximum of our discomfort was a short ride in a cold street car, and a rather constant worry as to fuel. Our experience with sledging was limited to short hauls of a couple of bags of coal on a toboggan. But, as the above letters show, our troubles are rather insignificant, as compared with those constantly encountered by these people of the north, who labor whole-heartedly, summer and winter, in these isolated regions.

NOTES AND OBSERVATIONS.

Annual Meeting of the Canadian Society for the Protection of Birds.—We are in receipt of the minutes of the annual meeting of the Canadian Society for the Protection of Birds, held in Toronto, Dec. 31, 1918.

Preceding the business meeting a complementary luncheon was held in honor of the retiring president, Dr. C. K. Clarke, at which felicitous remarks and speeches were made.

The secretary's report showed that though a lack of funds had been felt, considerable work had been accomplished through the year. The society brought Mr. Harold Baynes, of Meriden, N.H., to lecture on April 4 during the convocation of the Ontario Educational Association on "Wild Birds and How to Attract Them." In September a bird fete was organized at which Mr. W. D. Hobson, of Woodstock, spoke. Another lecture was also given by Mr. Hobson on Nov. 19, on "Bird Calls and Bird Ways".

The following officers were unanimously elected for the coming year: President, Frank F. Payne; vice-presidents, Dr. N. A. Powell and Principal Charles G. Fraser; secretary, Miss Laura B. Durand; directors, Miss Barbara A. Ewan, Mrs. L. Clark Macklem, Mrs. Arthur McFarlane, Mr. Herbert Barton.

At the first meeting of the Executive on Jan. 6 Dr. Clarke was elected the society's first honorary president and Dr. A. H. Mackay, Superintendent of Education, N.S., the first provincial vice-president. It is understood to be the policy to have similar representation in the other provinces.

The object of the society is: (*a*) to instruct the public regarding the importance of protecting bird life in the interests of the country, by holding meetings, lectures and exhibitions; (*b*) to publish and distribute literature relating to birds and cooperate with the Federal and Provincial Governments and regularly organized natural history societies throughout Canada in this respect; also to acquire and maintain a library; (*c*) to secure legislation on behalf of bird protection in addition to existing legislation and to assist in enforcing the same; (*d*) to forward the study of migration and all other matters relating to the nature of birds.

The members are of four classes, honorary, life, annual and junior. Life members are those who pay the tsum of $10.00 at one time, annual members pay $1.00 each year. Juniors are children of fifteen years of age or under who are enrolled without fee on signing the pledge.

Branches may be formed in any place and affiliation is invited. County clerks and all other persons are asked to co-operate and report violations of bird protection acts, and the public is asked to limit the number of cats in order that birds may increase, to confine pet cats or keep them under observation during the nesting season, and report to the local Humane Society's officers the presence of stray or unowned cats.

The pledge of the Society is as follows:

"In becoming a member of the Canadian Society for the Protection of Birds, I pledge myself to protect all useful wild birds from their enemies by every means in my power; to promote the study of their lives, and to influence others to do the same".

The Ottawa Naturalist wishes the society every success.

Alberta Natural History Society.—The 13th annual meeting of the society was held at Red Deer, Friday, Dec. 27, 1918. At the afternoon session the usual business was transacted, including the reading and passing upon of the report and financial statement of the secretary-treasurer, and the election of officers for the ensuing year, viz: Hon. president, Hon. D. Marshall; Hon. vice-president, Mr. J. J. Gaetz, M.P.P.; second Hon. vice-president, Mr. H. A. Craig; president, Mr. F. C. Whitehouse; vice-president, Mrs. W. A. Cassels; second vice-president, Dr. H. George; directors, Mrs. George, Mrs. Pamley, Mrs. Root, Miss Cole, Miss Goudie, Mr. E. Wilton; Edmonton—Messrs. K. Bowman, F. S. Carr, D. Mackie.

At the evening session the following papers were read: the executive report, Mrs. Cassels; annual entomological report, dealing with insect pests, etc., Mr. Whitehouse; Alberta mammals of the carnivorous group, Dr. George. Dr. George's paper was fully illustrated by specimens from his fine collection; Faunal zones, Mr. Whitehouse; insects and other specimens, representative of the different Alberta zones, were shown, with maps, defining the areas of life.

During the past two years the following papers have been given:

March 28, 1917—Insect Pests, Mr. Whitehouse.

April 25—Water-birds at Sylvan lake, Mrs. W. A. Cassels.

Birds of Alberta, Dr. H. George.

May 30—Fishes of Alberta and adjacent waters, Mr. Whitehouse.

Sept. 26—Dragonflies, Mr. Whitehouse.

Oct. 26—Nature study in Schools; its difficulties, Miss M. Cole.

Nov. 23—Alberta Beetles, Mr. F. S. Carr, of Edmonton.

Insect collecting Mt. Coliseum, Nordegg, Alta., Mr. Whitehouse.

Feb. 22, 1918—Prehistoric Reptiles, Mr. Wilton.
March 2—Wild Fruits of Alberta, Mrs. George.
May 31—Geological History, Mr. L. J. Williams.

The Society's report is published annually in the Report of the Provincial Department of Agriculture.

A NOVEL MODE OF MOVING A FAMILY.—A unique plan for carrying their families from one place to another is adopted by certain mammals. The method, which is simple but effective, consists in each young one taking such a firm hold of a teat that it is not loosened even after the mother has moved a considerable distance.

The female White-footed Mouse, *Peromyscus leucopus* Raf. is known to carry her family quite frequently in this manner. The following quotation from *A Hermit's Wild Friends* by Mason A. Walton, refers to this mouse: "If the young mice are small in some mysterious way the mother mouse induces each youngster to cling to a teat, when the whole family is removed in this novel manner to a safe retreat beneath the cabin. It is a comical sight to see the old mouse crawling along a log with eight or ten raw, shapeless things clinging to her like grim death."

Several years ago I saw a meadow-mouse, *Microtus pennsylvanicus*, succeed in saving her young by this method. She had been driven from her burrow under a stump by a dog, but managed to escape, trailing her whole litter into another burrow. The young mice in this instance were much more mature than those referred to by the "Hermit".

The muskrat, *Fiber zibethicus* Linn. has also developed this plan of making a quick withdrawal with her family. I have noted this only on one occasion, but at that time the mother swam several yards under water from one burrow entrance to another and towed her youngsters, which could plainly be seen clinging to her. She must also have brought them in the same manner along the burrow from the nest above high-water mark.

A. COSENS, TORONTO.

HABITAT OF CAREX FRANKLINII, BOOTT.—*Carex Franklinii* was collected by the writer at four stations along the Athabaska river in 1917 and 1918 at extreme distances of 20 miles apart and in each case the habitat was the same. Here and there along the Athabaska river there are low boggy areas bordering the river itself. These bogs are caused by seepage from the true bank of the river or by springs and are characteristic of all mountain streams. There is generally a considerable trace of "alkali" in the soil as is indicated by the occurrence of *Ranunculus, Cymbalaria, Triglochin, Puccinellia, Dodecatheon, etc.* Between these bogs, which are often only a few yards in width, and the river there is always a narrow strip of higher ground formed of alluvium which although submerged at high water is generally a few feet above the river bed. It was always on this narrow strip that *Carex Franklinii* was found and of the hundred or more specimens collected all but two or three were on the river edge of this bank associated with the usual plants of such localities.

During parts of two seasons spent at Jasper Park a constant lookout was kept for this species which had not been collected since Drummond's time, but it was seen nowhere else but in the localities indicated. As the old "Athabaska Trail" in many places follows the narrow strip referred to above and this was the trail followed by Drummond, it is reasonable to suppose that his specimens were collected not far from the localities at which *Carex Franklinii* was found in 1917 and 1918. This species is represented in the herbarium of the Geological Survey of Canada by the following specimens from Jasper Park, No. 97,622, along Athabaska river at discharge of Beauvert lake, Alta., 3,300 ft., July 24th, 1917; No. 94,208, same locality, collected by Dr. M. O. Malte, July 31st, 1917; No. 97,621, same locality, July 23rd, 1918; No. 97,623, about three-fourths of a mile above the bridge across Athabaska river, 2 specimens only; No. 97,624, along Athabaska river near Buffalo Prairie, Aug. 3rd, 1918; No. 97,625, north side of Athabaska river across from discharge of Beauvert lake, July 1st, 1918.

J. M. MACOUN.

A FISH SHOWER.—Although there are many records of showers of fishes, frogs and toads, such accounts are commonly regarded as apocryphal, based on mistaken observation or faulty reasoning.

An account of a fish shower in a Toronto paper of February, 1917, seemed to afford an opportunity for investigating one of these surprising phenomena. The fish fell in Durham county, Hope township, concession 9, lot 16. On writing to the owner of the farm I was furnished with the following details: On the last Friday of February, 1917, the fish came down in a shower of rain, that was followed by a soft snow. A mild south wind was blowing at the time. The fish were found, a few yards apart, scattered over a distance of twenty rods. Twenty-five of them were picked up from the surface of the snow, which was soft and deep in that locality.

A specimen of the fish sent to me is two and three-quarter inches in length. After comparing it with a small Gaspereau herring in the collection of Mr. C. W. Nash, Provincial Biologist, there is no reasonable doubt but that it belongs to that species.

Surprising as the conclusion is, there seems no other possible explanation but that the fish were carried from Lake Ontario, the shore of which is approximately twelve miles from where the specimens were found.

A. COSENS, TORONTO.

DIRCA PALUSTRIS L. IN NEW BRUNSWICK.—In the summer of 1918, while visiting at Loggieville, a small town at the mouth of the Miramichi river, and four miles below Chatham, I met with a strange shrub growing in small open spaces among white spruce and balsam firs, which clothe densely the low sandy plain, that everywhere skirts the shore and extends many miles inland. It grew in small dense hazel-like clumps, and rose to the height of four or five feet. No flowers were to be seen, nor was any fruit found, either on the bushes or on the ground beneath. Samples were taken and submitted to Mr. J. M. Macoun, head naturalist to the Geological Survey, who pronounced it this species. The large ovate leaves of a pea-green colour, the pale ashy bark, the stout stems branching freely and tree-like, and the jointed branches themselves were all somewhat universal and attracted the attention. Familiar with the botany of northern New Brunswick for many years, and having collected all over it, I readily spotted the stranger. It must be very rare. The light spongy snow-white wood and the thick tough bark that easily separates into thin lace-like layers of a delicate complex structure, recalling that of the Lace Tree of the West Indies, to which the Leatherwood is a near relative, were exceedingly interesting features whose examination afforded me a very enjoyable afternoon. Authorities assign a swamp habitat to this species, as its specific name implies, but these slightly undulating plains are largely dry, indeed very dry, in midsummer; at all events the clumps I found were upon a parched sandy soil.

Though common in central and eastern Ontario and in the valley of the St. Lawrence as far as Ste. Anne, Champlain Co., it is rare eastward. In "Preliminary List of the Plants of New Brunswick," Bull. No. IV, Nat. Hist. Soc. of N.B., 1885, by the Rev. (Dr.) James Fowler, professor emeritus of Queen's University, Kingston, the author assigns two stations to N.B., namely, Keswick Ridge, York Co., and Hillsboro, Albert Co. In "Catalogue of Canadian Plants," published the following year, Prof. John Macoun was able to add no further stations to its distribution in the Maritime Provinces. It does not seem to have ever been reported from Prince Edward Island or Nova Scotia.

PHILIP COX.

University of New Brunswick,
Fredericton, N.B.

A LATE RECORD FOR HORNED LARKS.—On January 8, while on a C.N.R. train, I saw a crow in a sheltered ravine about five miles east from Ottawa. A little farther on I was surprised to see two horned larks, feeding on seeds of exposed weeds in the vicinity of a farm building. The larks were plainly seen, both on the ground and in flight. Later, near L'Orignal, I saw a more familiar bird at this season, a horned owl. I have heard of no crows in the vicinity of Montreal since Nov. 24, although it is not unusual for a few to winter in favourable localities, but the presence of horned larks seems worthy of recording, as I have no record of their occurrence at Montreal during December and January. Possibly they remain later at Ottawa. Of course I was unable to determine the subspecies, but my notes show that the more northern birds *O. a. alpestris* never stay as late as our summer resident *O. a. praticola*, and that late November records of *praticola* are for single birds or couples, while *alpestris* has always been found in considerable flocks.

L. McI. TERRILL.

BOOK NOTICES AND REVIEWS.

THREE YOUNG CRUSOES, published and for sale by Wm. Alphonso Murrill, A.M., Ph.D., Bronxwood Park, New York City. Price $1.50.

This book which contains a story of the Life and Adventures of Three Young People on an Island in the West Indies, was written for the entertainment of children between the ages of twelve and eighteen years. The characters are fictitious, but the natural history is reliable and visitors to any part of the West Indies may find the book helpful. It consists of thirty-two chapters with eighty-three illustrations and two colored plates.

Teachers will also find this work useful, as it describes the animals, trees, flowers, fruits, birds, fishes and minerals to be found on the Island.

R. M. G.

The *Auk* for January, 1919, contains a number of articles of interest to Canadians.

THE BIRDS OF THE RED DEER RIVER, ALBERTA, by P. A. Taverner, pp. 2-21, 4 pl. This is based upon explorations and collections made by the Geological Survey in the Red Deer Valley in 1917, but in addition includes all other ornithological matter to hand on the district. After a general introduction, description of the region and sources of information, is an annotated list of 79 species, from the grebe through the birds of prey. A second instalment is to continue and conclude the list. The plates give typical river views and nesting sites of Ferruginous Roughleg Hawk and Prairie Falcon.

FURTHER NOTES ON NEW BRUNSWICK BIRDS, by P. B. Philipp and B. S. Bowdish, pp. 36-43, 2 pl. This gives the results of ornithological investigations in Northumberland Co., N.B., in the summer of 1917, being additional to papers on the same locally published, *Auk*, 1916, pp.1-8, and *ibid*, 1917, pp., 265-275. Annotations are given on 43 species. Most of the notes are on life-history and oological subjects, but the distributional data included is of considerable assistance to an understanding of Maritime Province conditions. Probably the most striking result obtained was the finding of four nests of the Cape May Warbler which as a breeding bird remains one of the very rarest of the warblers. The plates are admirable and show nests of the Cape May Warbler and Arctic Three-toed Woodpecker, a Wilson's Snipe on the nest, and a remarkable fine portrait of a Three-toed Woodpecker itself.

On looking over the list one cannot help wondering at the basis of the subspecific designations. There is nothing to indicate either that specimens were taken, or if taken, who is responsible for and upon what grounds they were diagnosed. The internal evidence suggests that the writers merely followed "common report", a very common practice nowadays, but not a scientific method and one that should be reformed. The great majority of the determinations are probably correct. One case at least gives force to this protest. *Dryobates villosus leucomelas*, the Northern Hairy Woodpecker is given as the local form. Though this race has become firmly fixed in current southern Canadian literature, according to all exact data available to the reviewer this is, in the nest, a high northern form and its occurrence in summer south of the Gulf is a questionable assumption. The authors may possibly be correct in this case, but without further evidence than the mere statement of a name we are warranted in stating doubt. It is the view of the reviewer that the use of the subspecific name and trinomial is only warranted when specimens have been critically examined and identity established by competent authority. Otherwise the specific binominal answers every purpose and is just as exact as hypothetical trinomial.

NOTES ON SOME BIRDS OF THE OKANAGAN VALLEY, BRITISH COLUMBIA, by J. A. Munro, pp. 64-74. This paper gives extensive annotations on twenty species of this interesting section. It contains a great amount of life-history and breeding notes on some interesting species. The remarks regarding the food of some of the hawks is specially interesting to the reviewer. The Big Red-tails are noted as feeding on various small mammals such as Ground and Pine Squirrels and Pikas; and some interesting data is given upon Swainson's Hawk coming in in numbers to feed upon a plague of large black crickets that were eating every green thing in sight near Vernon in 1915. The Magpies are said to be the worst egg thieves of the corvidæ and are showing undue increase. The description of Richardson's Grouse is particularly interesting and introduces much new information into our literature. On the whole, this is an admirable article. A criticism similar to that above would apply equally here. Though we happen to know that Mr. Munro has specimens of all or most of his species and has given them critical examination, this is not evident from the context and its "inside information" that gives us confidence in his subspecific determinaitons. Even then I would like to ask if he is certain it was *Planesticus migratorius propinqua* that was seen from a distance teasing the Red-tail (p. 68). As described, the conditions of observation do not seem all that could be desired for the recognition of this poorly defined form. Without doubt Mr. Munro regards this as the breeding Robin in his section, but we fail to see the necessity of advancing a hypothetical subspecies where the species does just as well and is, under the conditions, all that he can be confident of? I would say that neither Mr. Munro or the above authors are specially singled out for this stricture as the practice is a well nigh universal one amongst ornithological writers. It is only by calling attention to an indefensible general practice that it can be corrected.

In GENERAL NOTES, p. 100-101, W. L. McAtee under title "Further Notes on the 'Fishy' Flavor of Birds", shows that this is not caused by the eating of fish. That fish-eating birds are not necessarily fishy in flavor and many species that eat little or no fish are often so characterized. He does not doubt that the food eaten influences the flavor of the eater but regards "fishy" in this connection as a loose term for flavors that have nothing to do with fish.

Under NOTES ON NORTH AMERICAN BIRDS, pp. 81-85, H. C. Oberholser discusses the proposed reduction of our American Green-winged Teal of subspecific relationship with the European form as endorsed by the Committee of the British Ornithologist's Union. He finds that the two are separated by constant characters and show no indications of intergrading. He, therefore, decides that the two are specifically distinct as at present regarded in our Check lists. On contrary grounds he supports Hartet's contention that the American Marsh Hawk is only superficially distinct from the European bird and should stand as *Circus cyaneus hudsonius*. Similarly he also lumps our Short-billed Gull with the Common Gull of Europe, calling it *Larus canus brachyrhynchus*. He also finds that the North-west Crow hitherto regarded as a distinct species intergrades with the Western Crow which is only subspecifically distinct from the eastern bird. If this is demonstratable the North-west Crow will have to be called in future *Corvus brachyrhynchos caurinus*.

P. A. T.

FOOD, FEEDING AND DRINKING APPLIANCES AND NESTING MATERIAL TO ATTRACT BIRDS. By Edward Howe Forbush. The Commonwealth of Massachusetts. State Department of Agriculture. Departmental Circular No. 2. September, 1918.

In an attractive little pamphlet of 31 pages, with 30 figures, drawings, and halftone illustrations, Mr. Forbush gives an interesting summary of most of the successful devices which are being used by bird-lovers to attract birds to the vicinity of their city homes and country estates. First and foremost he recommends the elimination of the house cats. As extirpation of the neighbor's felines is not always practicable, he recommends enclosure of the yard by a cat-proof fence. The only always successful fence for this purpose is a fine-meshed wire netting 6 feet high, with a fish-net suspended from slim poles at the top. Tangles of vines and shrubbery are recommended as places of shelter and retreat for small birds.

The first and greatest need of birds, however, is food, and by judicious and systematic feeding many winter birds may be induced to come around the house and often become so tame that they will eat from the hand. Many birds' lives may also be saved by feeding at exceptional times in spring and autumn, when the weather is unusually cold or wet, or sleety, so that the birds become chilled and weakened and cannot find sufficient food. Whole grain, which can be used for human food, for farm animals or poultry, is unnecessary for small birds, but may be used for game birds. Where weeds are abundant, the smaller seed-eating birds need little else, but where weeds are kept down, or where they are covered with snow, other food should be provided. Many cultivated flowering annuals, such as asters, portulacas, California poppies, etc., bear seeds attractive to seed-eating birds.

Chickadees, nuthatches, jays, and some other birds are fond of nut meats, as well as fatty bits of meat, suet, skinned carcasses of small animals, and the like. Suet should be enclosed in crocheted bags, or tied to the branches of trees to prevent greedy crows or jays from carrying off the whole piece at once. Grits, sand, broken plaster, etc., are attractive to birds as an aid to digestion, and they sometimes have difficulty in satisfying their desires for it when the ground is covered with snow. Ground-feeding birds are often necessarily fed on the ground at first to accustom them to food receptacles, but ground feeding is wasteful, the food being spoiled by rain or covered by snow and ice unless it is under cover.

A feeding shelf or table may be set at a window on the south side of the house and supplied from inside, or a moving food-shelf may be hung on a near-by tree. The birds may be watched at close range from within if the window is protected by a sash-curtain. The weather-vane food house is considered the most perfect device for outdoor feeding, and should have a hopper on top that can be filled with seed. The weather-vane food house swings with the wind and always keeps the opening away from wind and storm. Various anti-squirrel and anti-sparrow devices are recommended to those who do not care to feed English sparrows or squirrels. For instance, two pieces of suet may be suspended by a piece of string. Native birds will readily cling and feed, but the sparrows find it difficult. The method employed by Mr. W. E. Saunders, of London, Ontario, is to pour melted tallow mixed with sunflower seeds upon a flat board with a perch to which the native birds can cling, the board being fastened up in an inverted position.

In summer, shallow drinking pools, bird baths, and fountains are attractive to birds. Bird baths should preferably be placed in the shade, with no cover immediately about them to hide the approach of cats, which soon learn where the birds congregate.

To attract wild fowl, a pool, lake, or stream is necessary, but these may be made more attractive by propagating various species of wild water-plants which are eaten by such birds. Grouse are best attracted by feeding them in winter and protecting them against enemies. Nesting places, nesting material, bird-houses, and bird sleeping-places are also discussed.

Each family or group of birds has certain preferences of habitat and certain favorite foods, and Mr. Forbush gives special notes on the fancies and foibles of about forty of the more common species which are susceptible to human attentions, and the whole will repay the study of any person who enjoys the presence of birds around his home. Many of the devices and hints described, would be useful to teachers of nature study or manual training in schools where the pupils are encouraged in the building and setting up of bird-houses and refuges.

R. M. ANDERSON.

"POSITION TERRIFIANTE" DES ANIMAUX. *Siedlecki, Michel, 1919.** Comptes Rendus, Societe de Biologie. Tome LXXXII, No. 2.

It is a well known fact that when certain animals are suddenly surprised by their enemies or by passers-by which appear dangerous, they assume extraordinary positions, which are most often called positions of combat or terrifying positions. The best common examples are those of the cat pursued by a dog, or of the corba raising up and spreading its neck. Savants have considered this attitude as a voluntary conscious action.

The object of this attitude would be to protect. Weismann mentions, *Chaerocampa elpenor*, a caterpillar, which he believes frightens the animals which prey on it.

My idea concerning these attitudes is that they accord with the generally admitted theories.

Certain animals such as the large spiders, *Selenocosmia javanica*, or the scorpions, *Heterometrus javanicus*, when they put themselves in a terrifying position present their weapons of offence (cheliceræ or venomous hooks) they place them in an easy position for attack.

Other animals behave in a totally different manner. The corba in striking its prey does not lift itself up or swell its neck. The brown mantis, *Deroplatys desiccata*, when it sees a lizard spreads its wings and lifts up its anterior legs, but when it is about to capture its prey the wings remain closed and the pincer-legs are folded on the thorax.

The European mantids when they are about to fight among themselves seldom assume the terrifying position (Fabre).

The terrifying position is most often without value as a means of defence. We have seen a large lizard, *Gecko verticillatus*, devour a mantid without hesitation, which had assumed a terrifying position. We have also seen a mantid which was catching a caterpillar, *Papilio demolion*, assuming a position which resembled closely that of *Chaerocampa elpenor*, studied by Weismann.

Often this terrifying attitude is assumed even when the animal is not in danger. We have seen a mantis, *Mantis laticollis*, assume a terrifying position the minute that we lightly jarred the cage in which the animal was held captive. On the contrary, a mantis placed with a scorpion in a large container defended itself in vain with its strong anterior legs, but did not assume the attitude which is called combative.

One of the most interesting things concerning an animal which assumes a terrifying position appears to be the relation which fatigue bears to this phenomenon.

NOTE.—The first time we noticed the connection between the terrifying position and that of fatigue was exemplified by a large lizard, *Varanus salvator*, 1m40 in length, which had been brought to us in a basket by a Malayan coolie. The animal was very weak and made no resistance when we placed it in a basin. For three days he was kept there without food; and did not move when touched with a stick. He was taken out of the basin to be chloroformed, but at the moment when the laboratory helper was putting a sack over his head with the chloroform, the animal suddenly assumed a terrifying aspect. The anterior feet were lifted up, its throat swelled, its mouth was open, showing rows of teeth, the tail was lifted up rigid ready to strike and the position it assumed was certainly imposing. But despite all this, the animal was in so feeble a condition that there was no difficulty experienced in capturing him.

The same animals, which in a full state of vigor do not assume the terrifying attitude, make use of it as soon as they become weak. We have observed the females of the large yellow spiders, *Platythomisus octomaculatus*, which after they had laid their eggs and had constructed their large cocoons upon which they rested; it was then only necessary to approach them to immediately provoke the terrifying position. Resting firmly on the cocoon with the four posterior legs, the animal extended its anterior extremities and produced with these an oscillatory movement of such rapidity that they became nearly invisible. The spider resembled somewhat an enormous wasp; but far from being dangerous, she had become completely weak and impotent. Before egg-laying these females never assume the terrifying position, and it is only after egg-laying, when the organism has becomed weakened by the immense drain on its materials, that this bizarre position becomes manifest.

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*Translated by S. Hadwen.

In certain cases, we have been able to provoke the apparition of the terrifying position by causing animals to become fatigued.

A mantis, *Mantis laticollis*, when it is frightened is in the habit of spreading its wings and its anterior extremities, resting on its four posterior legs. It swells its abdomen which at this moment produces two hernias formed by two little sacs placed between the two anti-penultimate abdominal rings. These sacs are of a very striking color. The anterior pairs are dark blue, and the posterior are red. It is not always easy to force the animal to take on this bizarre position. We have succeeded by shaking the animal, by dragging it by one leg, and by brusquely approaching it with the hand when it was on a limb. This position only lasts about thirty seconds and appears to necessitate a great effort. We have fatigued the animal by forcing it to run inside a cage until it was so weak that it could not stand up. It was then that it assumed the terrifying position, it swelled out its abdomen, and died without changing position.

Similar effects have been observed with flying lizards *Draco volans* and *Draco fimbriatus*. These animals, when pressed, tried to run away; when they were forced to jump they spread out their parachute membranes and vol-planed for a long distance. But finally when over fatigued and when they could no longer run they assumed the terrifying position, opening their mouths and spreading their lateral membranes. When they were still further forced to run and jump they died of fatigue, still holding the terrifying attitude.

From the observations cited, and from others it results that—in the majority of cases the terrifying position is nothing else but a reflex provoked by a general irritation of the entire organism. One cannot exclude the fact that this irritation is provoked by sensations derived through the intermediary of the senses; in these cases the terrifying position has all the appearances of a voluntary action; but the same effect can be obtained by the action of other agents which affect the entire organism (such as fatigue). The terrifying position in our judgment is not a voluntary or conscious action.

SATURDAY AFTERNOON EXCURSIONS FOR 1919.

May 10—Geology; Leamy's Lake, just east of Hull; meet at the end of the Chelsea road electric car line.

May 17—Zoology; Catfish Bay, just west of Hull along the Ottawa; meet at Eddy's office, end of city street car line in Hull.

May 31—Economic entomology; Aylmer Park; by Mr. C. B. Hutchings, Department of Agriculture.

June 7—Ornithology; Beaver Meadow, just west of Hull, along Aylmer road; meet at Eddy's office.

June 14—Zoology; general; across the Gatineau from Gatineau Point; meet the ferry at Rockcliffe Park.

June 21—General; Black Rapids by steamer Wanekewan (consult steamboat time-table—starts about 1.30 p.m.); a reduced rate for the trip will likely be arranged.

Sept. 20—Fungi and fall botany; Billings' woods; meet at end of Bank street car line on Bank street.

Sept. 27—Ferns and Mosses; woods about three-quarters of a mile east of Billings' Bridge; meet at end of Bank street car line.

The time of meeting at the points indicated will be 2.45 p.m., except in the case of the Black Rapids excursion.

Leaders conversant with the subjects mentioned will be on hand to render assistance.

Local members and any others interested are given a most cordial invitation to attend.

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